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UNITED STATES SHIPPING BOARD
WASHINGTON

December 29, 1917.

Mr. John A. Penton
Publisher, THE MARINE REVIEW,
Cleveland, O.

My dear Mr. Penton:

It is a pleasure to accept your invitation to pay tribute to the patriotism of the shipbuilding interests of the United States. Thanks to the manner in which they have responded to the call, we now have the situation well in hand. Lack of manpower and inadequate housing have furnished serious obstacles, but I believe the public appeal we are now making will do much to bring a solution of these problems.

Not only have we had to build the ships, but we have also had to build the yards. Contracts have been let to 113 shipyards, of which 74 are entirely new, 16 are small yards expanded and 23 are old established yards. In addition we have commandeered all steel construction over and above 2500 tons being built for either foreign or domestic account.

The total tonnage, the construction of which will be carried on into the year 1919, will approximate 11,000,000 tons of wood and steel vessels. Of this approximately 1,500,000 tons will be wooden vessels constructed chiefly for the emergency and which will be afloat carrying supplies to our armies in France during the coming year.

The first contract ship was finished within the remarkably short period of sixty-four days after construction was begun. The work thus far has been in many cases preparatory but this period of preparation is getting rapidly behind us and the period of actual ship construction in full accordance with our plans is immediately before us. We are making every effort to speed up all along the line.

The ships will be built!

Very truly yours,

Edward N. Hurley

Chairman.

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Shipbuilding Program Analyzed

A Study of the Plans of the Emergency Fleet Corporation —Three Million Ton Mark Will Be Reached This Year

WAR, that crowning paradox of the age, at once the most destructive and most powerful re-energizing force in existence, has implanted its marvelous leaven in the shipbuilding industries of the United States. As a result, an American merchant marine is coming into being and a new source of national wealth is developing, the beneficial effects of which will be felt long after the terrible struggle in Europe has been brought to a close.

Rudely awakened by the shock of arms, the country at last realizes the necessity for redeeming its lost heritage on the sea. We have witnessed, therefore, in the year just closed, a complete metamorphosis of American shipbuilding. From a comparatively minor station, catering largely to foreign interests, shipbuilding has advanced overnight to a pre-eminent position in our business life and at the same time has become the first completely nationalized industry in American history. Almost at one bound production has been speeded up from 200,000 to 1,000,000 tons a year, with the goal of 6,000,000 tons a year a measurable distance ahead.

A New Standard of Values

In any review of the shipbuilding situation as it exists at present, it is clear a new standard of values must be set up. We are confronted with a tremendous task upon the successful accomplishment of which our national existence depends. Temporarily at least, all considerations of economics and business expediency have been swept into the discard. The cry is for ships, ships and yet more ships. We are trying to do in one brief year what in our short-sighted, inward-looking folly we failed to do in the past decade.

Therefore, no ordinary, drab statistical survey of shipbuilding during 1917 will serve the present situation. We are interested in what has been done only insofar as it throws any light on what will be accomplished in the months that lie immediately ahead. The main outlines of the problem can be most simply presented graphically.

The shipping board's program, as announced at the recent hearings in Washington, calls for 1427 ships aggregating 8,573,108 deadweight tons. The details are given in Table I. How rapidly this program will be executed may be judged by studying Fig. 1, which shows graphically how our shipbuilding capacity of 200,000 tons a year on Dec. 31, 1916, has grown to 1,000,000 tons a year and

E. N. HURLEY

Every shipbuilder, every shipowner and every citizen should read Mr. Hurley's inspiring message on the preceding page. It gives you a glimpse of the great task that must be accomplished to defeat the U-boats and win the war

will reach 5,000,000 tons by the close of 1918. It should be borne in mind also that a portion of the shipping board's task is already finished. This is shown graphically in Fig. 2, which indicates that 18.2 per cent of the

Table I

SUMMARY OF FLEET CORPORATION PROGRAM AS OF DEC. 1, 1917

Type of vessel	Number of vessels	Total deadweight capacity tons
Wood	379	1,344,900
Composite	58	207,000
Steel	559	3,965,208
Total contracted for..	996	5,517,108
Total requisitioned...	431	3,056,000
Grand total	1427	8,573,108

entire program was completed on Dec. 1, 1917. Of steel ships building under contracts let by the Emergency Fleet corporation, 4.4 per cent are completed, together with 39.2 per cent of the requisitioned ships, 9.6 per cent of the wooden ships and 20.2 per cent of the composite ships. This does not mean that a number of ships corresponding to the foregoing percentages have actually been delivered, but that the proportions indicated of the total amount of work involved in each case were finished on Dec. 1, 1917. Expressed in tons, these figures are as follows:

	Tons completed up to Dec. 1, 1917
Requisitioned ships	1,180,000
Steel ships under contract	174,000
Wooden ships under contract	129,000
Composite ships under contract	41,800
Total	1,524,800

The diagram shown in Fig. 2, from which the foregoing figures and ratios are deduced, is a reproduction of that presented to the senate committee on commerce by Rear Admiral Bowles of the Emergency Fleet corporation. The data as to work completed, therefore, are official.

The Proper Perspective

In order to obtain a proper perspective on the great shipbuilding problem with which we are now confronted, it is necessary to view it in the light of past achievements. For this purpose the diagram shown in Fig. 3 has been constructed from the data set forth in Table II. This diagram graphically illustrates German, American, British and world shipbuilding for 14 years. The effect of the war in extinguishing the merchant shipbuilding of Germany and greatly expanding both that of the United States and Great Britain is vividly shown.

The figures for this year, of course, are estimates based on official data. They indicate that the world's output for 1918 will be about 7,500,000 tons, of which the United States will be called upon to furnish 46½ per cent. Against this should be balanced submarine losses which it would not be safe to estimate at less than 4,000,000 tons and ordinary losses of 500,000 tons.

The net apparent increase in the world's tonnage for 1918 is therefore seen to be about 3,000,000 tons, none too much to overcome the lead gained by the submarine in 1917 and our needs for troop transport.

Nevertheless the goal will be reached. A stern chase is proverbially long, but not necessarily endless. There are those in the country

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posing as experts who profess to believe that American shipbuilding output in 1918 cannot exceed 2,500,000 tons. These estimates, however, take no account of law of increasing returns which applies to shipbuilding as much as to any other manufacturing proposition. In other words, the last million tons in the Fleet corporation's eight million-ton program will come a lot easier than the first.

All concerned are agreed that the labor situation lies at the root of the problem. Given a satisfactory supply of labor almost any amount of shipping could be turned out in the United States in a year. There is no lack of steel. The ship-plate rolling capacity of the country, which heretofore has represented the neck of the bottle as far as raw materials are concerned, is now sufficient for the construction of 14,000,000 deadweight tons of ships a year.

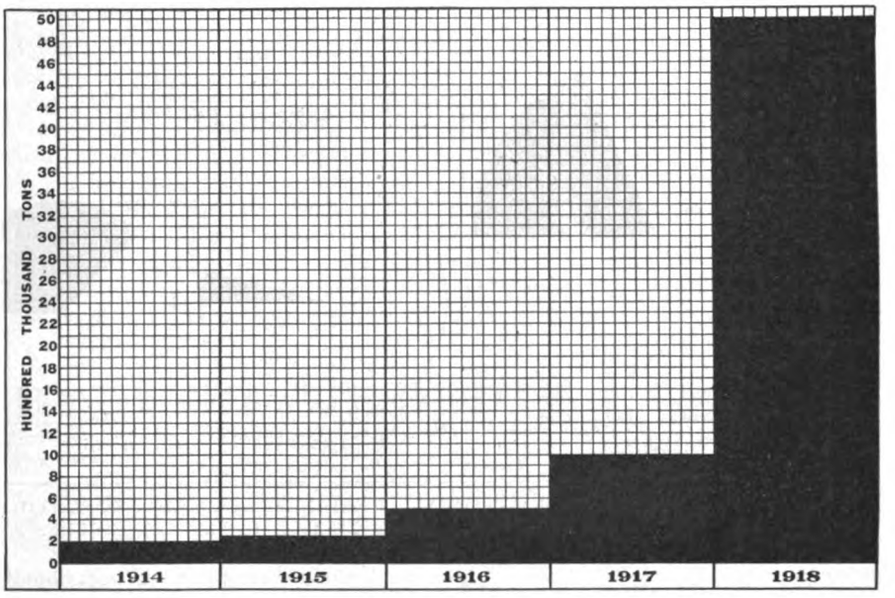

FIG. 1—DIAGRAM SHOWING SHIPBUILDING CAPACITY OF UNITED STATES IN TONS PER YEAR AT END OF EACH YEAR, 1914 TO 1918, INCLUSIVE

Solving the Housing Problem

Underlying the labor problem, and the extensive labor turnover which has made the solution of that problem difficult, is the housing situation. Workmen have flocked to shipyards only to find there was no place to live and no suitable environment for their families. As a result, they soon passed on to other jobs. The shipping board proposes to ameliorate this situation by attacking the housing problem vigorously and directly. It is understood that about $35,000,000 will be expended during the current year to provide housing facilities for shipyard workers. With the housing problem out of the way, and fortunately it can be solved rapidly, the present excessive labor turnover, averaging 300 per cent, will be greatly reduced.

The strike situation also appears to be slowly on the mend, Raymond B. Stevens, vice chairman of the shipping board, testified in the senate commerce committee's investigation that since the United States went to war our shipyards have lost a total of 536,992 working days by strikes and other labor disputes. This represents the work of approximately 20,000 men for a month. Deplorable as this record is, it is now in the background. The most serious center of disturbance, the north Pacific coast, seems to have quieted down to business. The Great Lakes, which now has an annual shipbuilding capacity of 350,000 tons, has had no labor troubles at any time. The situation on the Atlantic and Gulf coasts also is quiet. Proceeding on Mr. McAdoo's now famous principle that contented labor in the long run is the cheapest, the shipping board has encouraged the payment of liberal wages, with the result that riveters in some isolated cases are making as much as $90 per week. The wages of the workmen in American shipyards today are exceedingly attractive.

Although the extremely liberal wage policy which the board has adopted might be subject to severe criticism under ordinary circumstances, it can be defended at present on the ground that tonnage is the main desideratum and cost for the time being a decidedly secondary consideration. In fact, it was the lack of a full appreciation of this principle that led to the retirement of Admiral Capps from the head of the Emergency Fleet corporation.

Testimony presented by both Mr. Hurley and Mr. Stevens at the senate investigation indicates that there are now about 150,000 men actually engaged in shipbuilding in the United States. In addition, as Mr. Hurley points out, it must be borne in mind that all the shipbuilding effort is not confined to the shipyards. A very large proportion of the propelling machinery, winches, steering gears and other accessories are built in manufacturing establishments throughout the country and these concerns are contributing thousands of operatives to the shipbuilding program.

Must Engage More Men

With 150,000 men actually engaged in shipbuilding, the annual output is estimated at 2,250,000 deadweight tons, an output of 15 tons per man per year being considered satisfactory under modern American conditions. In order, therefore, to reach an output of 3,500,000 tons in 1918 approximately 235,000 men must be engaged. This represents an increase in the present force of 56.7 per cent.

The shipping board has perfected an organization especially for obtaining these men, and for training them after they are employed if necessary. It is known as the industrial service division and is operating under the direction of Meyer Bloomfield, formerly head of the labor de-

Table II

WORLD'S MERCHANT SHIPBUILDING FOR FOURTEEN YEARS

An analysis of the shipbuilding of the United States, Great Britain, Germany and the world since 1905, including an estimate for 1918. Lloyd's official figures used up to 1916.

	United States tons	England tons	Germany tons	World tons
1905	302,827	1,623,168	255,423	2,514,922
1906	441,087	1,828,343	318,230	2,919,763
1907	474,675	1,607,890	275,003	2,778,088
1908	304,543	929,669	207,777	1,833,286
1909	209,604	991,066	128,696	1,602,057
1910	331,318	1,143,169	159,303	1,957,853
1911	171,569	1,803,844	255,532	2,650,140
1912	284,223	1,738,514	375,317	2,901,769
1913	276,448	1,932,153	465,226	3,332,882
1914	200,762	1,683,553	387,192	2,852,753
1915	177,460	650,919	50,000	1,201,638
1916	500,000	1,000,000	10,000	2,000,000
1917	750,000	1,800,000	none	3,250,000
1918	3,500,000	3,000,000	none	7,500,000

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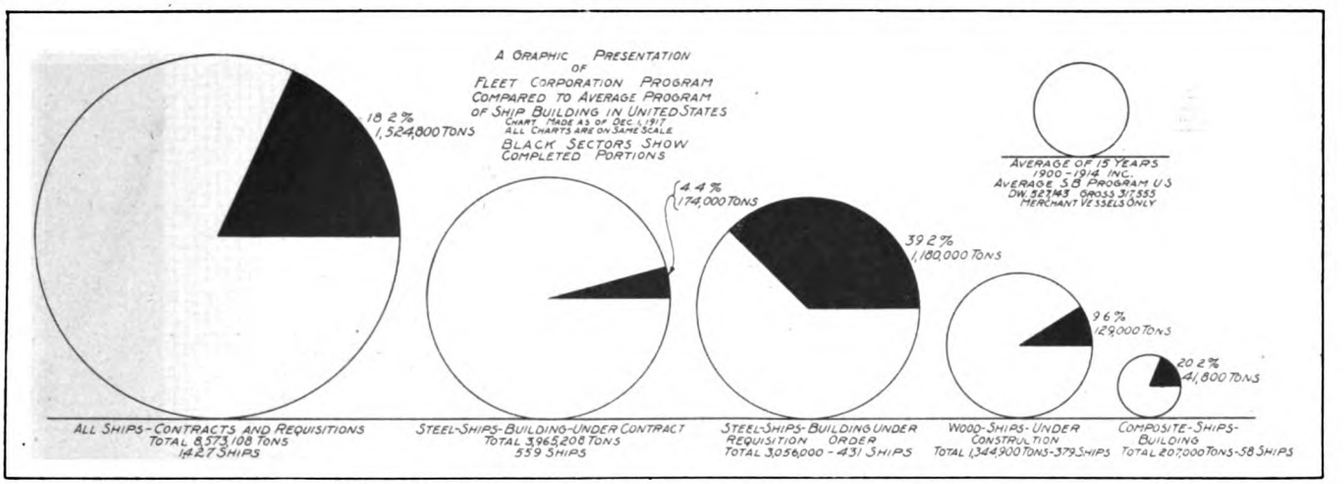
A GRAPHIC PRESENTATION OF FLEET CORPORATION PROGRAM COMPARED TO AVERAGE PROGRAM OF SHIP BUILDING IN UNITED STATES
CHART MADE AS OF DEC. 1, 1917
ALL CHARTS ARE ON SAME SCALE
BLACK SECTORS SHOW COMPLETED PORTIONS
18.2% 1,524,800 TONS
4.4% 174,000 TONS
39.2% 1,180,000 TONS
9.6% 129,000 TONS
20.2% 41,800 TONS
AVERAGE OF 15 YEARS 1900-1914 INC. AVERAGE S.B. PROGRAM U.S. DW. 527143 GROSS 317555 MERCHANT VESSELS ONLY
ALL SHIPS-CONTRACTS AND REQUISITIONS TOTAL 8,573,108 TONS 1427 SHIPS
STEEL-SHIPS-BUILDING-UNDER CONTRACT TOTAL 3,965,208 TONS 559 SHIPS
STEEL-SHIPS-BUILDING UNDER REQUISITION ORDER TOTAL 3,056,000 - 431 SHIPS
WOOD-SHIPS-UNDER CONSTRUCTION TOTAL 1,344,900 TONS-379 SHIPS
COMPOSITE-SHIPS-BUILDING TOTAL 207,000 TONS-58 SHIPS

FIG. 2—DIAGRAM PRESENTED AT SENATE HEARINGS SHOWING PROPORTION OF EMERGENCY FLEET CORPORATION PROGRAM COMPLETED ON DEC. 1, 1917—ALL CIRCLES ARE TO SAME SCALE

partment of the Fore River Shipbuilding Corp.

Admiral Bowles threw additional light on the labor situation by outlining the new legislation which the shipping board feels it needs in order to successfully complete its program. Briefly these needs, as stated by Admiral Bowles, are as follows:

1—Legislation granting authority to requisition the use of dwelling houses in the vicinity of shipyards.
2—Legislation granting authority to requisition additional street car and steam car service on routes leading from shipyards to centers of population.
3—Legislation establishing a war zone around every shipyard in the country.
4—Appropriation for various housing projects which the Fleet corporation has undertaken.

"There is still another matter which is holding up the development of shipbuilding and which might be remedied by legislation," Admiral Bowles also stated. "That is the matter of excess profits tax. Shipbuilders are becoming more and more reluctant to accept contracts at reasonable figures solely because of the uncertainty as to the excess profits tax situation."

"Would you propose to relieve them of the excess profit tax by special legislation?" asked Senator Jones of Washington.

"Yes. Why not?" replied Admiral Bowles.

This introduces another interesting angle to our shipbuilding problem, namely that of prices and profits. All are agreed that the shipbuilders are entitled to fair returns for their investment and industry and it also is generally conceded that this return should be as liberal as possible in order to stimulate further production. In the past, the shipping board has not always been as liberal as might have been desirable. On the other hand, the government has occasionally found itself in difficulties with builders who have been unable to fulfill their intentions. The Sloan Shipyards Corp. of Seattle is a case in point. The government has found it necessary to place a $750,000 mortgage on the Sloan plant to secure its interests.

The Cost of Our New Ships

The following figures on the cost of the work so far undertaken by the Emergency Fleet corporation, are interesting. Contracts have been let for 58 composite ships with a tonnage of 207,000. These ships will cost $27,732,000, or $133.97 per deadweight ton. The cost of the 557 steel ships contracted for up to the early part of December, will be $651,627,046. This amounts to $166.48 per ton, there being 3,914,200 tons involved. For the 379 wooden ships aggregating 1,344,900 tons contracted for up to Dec. 1, the government has obligated itself to pay $127,831,322 or $95 per ton. The grand average is $159.18 per ton.

CHARLES PIEZ,
Vice President, Emergency Fleet Corporation

To make possible the enormous shipbuilding program projected by the shipping board many new shipyards have had to be constructed from the ground up. In his testimony before the senate committee, which is published in full following this article, Mr. Hurley said that the Emergency Fleet corporation has let contracts to 110 shipyards of which only 36 existed on Jan. 1, 1917. In other words, 74 yards have been created since then. In addition, the Emergency Fleet corporation has requisitioned vessels which are building in 22 more yards, so that the corporation at present is controlling work in 132 yards, of which 58 are old and 74 are new.

Some of the largest shipyards in the world have been begun on the waters of Newark bay and the Delaware river, but almost everywhere, on the Atlantic and Pacific, the Gulf and the Great Lakes, new ways are being built to launch tonnage for the government.

In Newark bay, on the Port Newark Terminal, consisting of reclaimed flats, the Submarine Boat Corp. is building 150 fabricated steel ships of 5000 tons each. Twenty-eight shipways are under construction at this shipyard, which comprises 125 acres.

Another enormous shipyard being constructed from nothing is that of the American International Corp. at Hog Island, Philadelphia. Here 200 fabricated steel ships are to be launched for the government. At this plant, large ships of 7500 deadweight tons are to be built. At Chester and also at Bristol, on the Delaware, interests associated with Averill Harriman are building extensive yards where important contracts for fabri-

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cated steel ships will be executed. Vessels up to 9000 tons deadweight are to be constructed.

In order to expedite work on contracts received from the government the Bethlehem Steel Corp. recently consolidated its shipyards under a new corportion, known as the Bethlehem Shipbuilding Corp. This embraces the plants at Sparrows Point, Md.; the Union Iron Works, San Francisco; the Fore River Shipbuilding Co., Quincy, Mass., and Harlan & Hollingsworth, Wilmington, Del. The United States Steel Corp. is building a new shipyard on the Hackensack meadows, to be known as the Federal Shipbuilding Co. This is to be one of the largest in the world. Each of the 10 ways is to be 450 feet in length, and the steel buildings are to cover 10 acres. The corporation is also interested in a southern shipbuilding yard, which will be operated as a subsidiary of the Tennessee Coal, Iron & Railroad Co. The bulk of the wooden shipbuilding program is being carried out at Gulf and Pacific ports, reliance being had on the Southern yellow pine and Douglas fir of the respective areas. But on the Pacific coast, on Puget sound, the Columbia river, San Francisco bay and elsewhere, important steel contracts are also in course of execution. In fact, the first steel vessel to be launched for the Emergency Fleet was an 8800-ton steel ship built at Seattle.

Hurley's Statement on Shipping Program

FOLLOWING is the statement in full read by Chairman Hurley of the shipping board, Dec. 21, at the opening of the investigation by the senate commerce committee:

"At the outset of this inquiry I would like to say that the shipping board, appreciating the fact that the senate's desire is to be of national service, welcomes a thorough investigation of its activities and accomplishments.

"I am especially glad of the opportunity which this investigation affords to disclose the actual facts in the situation. When Admiral Capps and I joined the Emergency Fleet corporation on July 27, 1917, there were under contract 840,900 tons of wooden ships, 207,000 tons of composite ships, and 587,000 tons of steel ships.

"Since then additional contracts amounting to 3,378,200 tons of steel ships and 604,000 tons of wooden ships have been placed. In addition the fleet corporation has rendered financial aid to and is directing the work of extension and development in 42 yards. The remaining new yards are being constructed by private capital. A portion of the contracts placed since July 27 were prepared and practically closed by our predecessors. It must be borne in mind that this vast program of construction undertaken in the past nine months was superimposed on a navy program which was the equivalent in dollars and, therefore, in shipbuilding effort, of the construction of two and a half million tons of merchant shipping. The navy program absorbed practically 70 per cent of the 18 prominent yards in existence at the beginning of the war with Germany, the remaining 30 per cent of these yards being taken up with the construction of merchant shipping for both foreign and American account, which was requisitioned under the order of Aug. 3. This tonnage is now being completed under the supervision and control of the Emergency Fleet corporation. When we compare the total

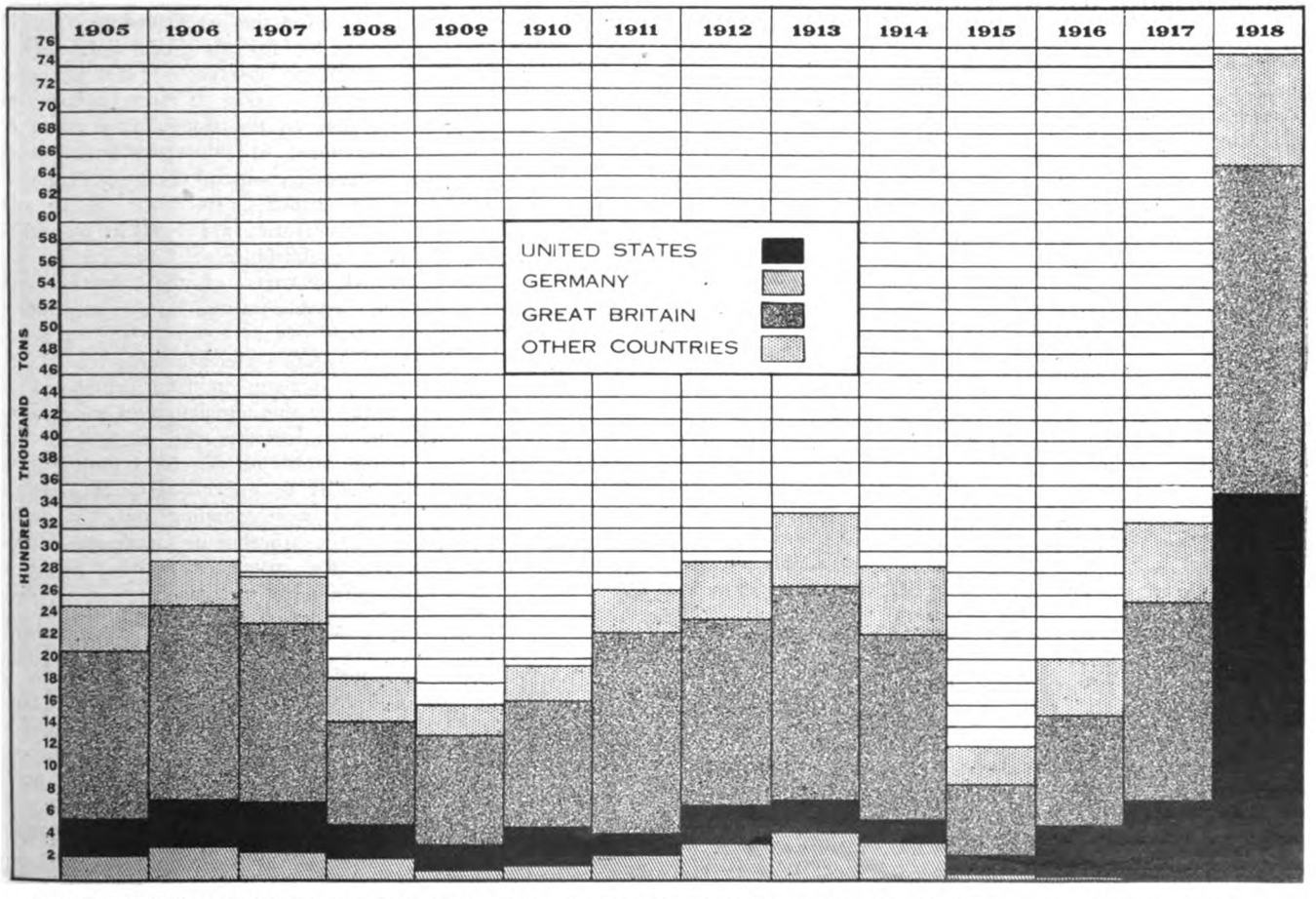

FIG. 3—DIAGRAM SHOWING EFFECT OF WAR ON MERCHANT SHIPBUILDING OF THREE GREAT POWERS AND THE WORLD—ADAPTED FROM TABLE II

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tonnage under construction for both the navy and the shipping board with the greatest annual output of American yards prior to the war, which Homer Ferguson in a recent article puts at 615,000 tons, some conception of the magnitude of our undertaking will be had.

Many New Yards

"The contracts of the Emergency Fleet corporation have been let to 110 shipyards of which 36 existed on Jan. 1, 1917, and 74 have been created since. In addition the Emergency Fleet corporation has requisitioned vessels which are building in 22 shipyards in addition to the above, so that the Fleet corporation is at present controlling work in 132 yards, of which 58 are old and 74 are new.

"The great and constant increase in new yards to be constructed and tonnage awarded has required a constant expansion of our organization and has compelled us to make changes which the proper carrying out of this vastly expanded program made imperative.

"The organization has been expanded not only with the idea of checking up and safeguarding the expenditure of the vast sum intrusted to our care, but with the idea of infusing both into the shipbuilders and the workmen engaged in the art that degree of enthusiasm for the work and interest in it that is absolutely essential to the carrying out of our purpose. We have recognized that it was necessary not only to vastly expand the number of men, and therefore to evolve a method of getting an adequate supply of labor and training it if necessary, but we have also been convinced of the necessity that we must spend more time in training up the executive and technical organization in those plants which have undertaken contracts for which their experience did not particularly fit them. The big problem we have before us is to secure an adequate supply of experienced labor and competent shipyard organizations to direct it. The first contract was let on April 27, 1917. During that and successive months contracts were let as follows:

Month	No. of contracts	No. of vessels	Tonnage
April	1	12	42,000
May	9	76	854,200
June	20	137	646,900
July	24	138	591,800
August	25	110	424,300
September	12	185	1,142,500
October	6	114	934,200
November	46	192	1,054,400
December	4	35	326,800
Total	147	999	5,917,100

"Of the total number of yards in existence on April 27 the capacity of the following yards has been largely absorbed by the needs of the navy department for destroyers and mine sweepers: Bath Iron Works, Bath, Me.; the Fore River Shipbuilding Corp., Quincy, Mass.; New York Shipbuilding Co., Camden, N. J.; William Cramps & Sons Shipbuilding Co., Philadelphia; Newport News Shipbuilding Co., Newport News, Va.; Seattle Construction & Dry Dock Co., Seattle; Union Iron Works, San Francisco; Alabama Dry Dock & Shipbuilding Co., Mobile, Ala.; Todd Shipyards Corp., New York; Staten Island Shipbuilding Co., Port Richmond, N. Y.; Standard Shipbuilding Co., New York; Pennsylvania Shipbuilding Co., Philadelphia; Chester Shipbuilding Co., Chester, Pa.; Pusey & Jones Co., Wilmington, Del.; Baltimore Dry Docks & Shipbuilding Co., Baltimore, Md.; Sun Shipbuilding Co., Philadelphia; Chas. L. Seabury and Gas Engine & Power Co., Morris Heights, N. Y.; and New Jersey Dry Dock & Transportation Co., Elizabethport, N. J.

Shipbuilding Statistics

For over a decade THE MARINE REVIEW *has published detailed statistics of shipbuilding in the United States at the beginning of each new year. Our statistical records in this number, which are more extensive than usual, include the most complete, detailed analysis of the program and prospects of the Emergency Fleet corporation that has yet been published, with a complete list of contracts let for steel, wood and composite ships. Tonnages and prices are given in each case.*

At the suggestion of the shipping board, however, we are omitting the usual details regarding actual number of vessels launched in each yard, the percentage of completion of vessels under way, dates for launchings in 1918, *etc. These statistics, it is felt by some, might be of value to the enemy. Therefore they have been reserved for our private files.*

Commends Standard Ship

"It was therefore necessary in order to meet the needs of the program fixed to construct not only new yards for the building of wooden ships, but also to construct additional yards for the construction of steel ships. The plan developed by our predecessors to standardize ship design and to build these standard ships in large numbers in specially equipped yards in which the assembly of material fabricated in existing structural steel and machine shops in the country could be carried on, is sound and will give a tremendous increased ship production at relatively small expense for new construction and without carrying with it excessive labor congestion at the shipyards themselves. A considerable portion of the effort of the organization has thus far been directed toward the completion of these so-called fabricated and other newly organized plants, the money expended up to Dec. 1 for this purpose being $9,651,000. I am happy to say that the first three keels in one of these plants will be laid this month and that the progress of the work of the yard construction itself is such that we can promise fairly full operation during the spring of 1918. The fact that hulls have actually been completed within 64 days on the Pacific coast gives bright promise of the large capacity which these fabricated yards are bound to turn out. I am mentioning this largely to indicate that the work thus far has been in many cases preparatory and that it has carried with it the usual amount of annoyances and disappointments, but this period of preparation is getting rapidly behind us and the period of actual ship construction in full accordance with our plans is immediately before us.

Increasing Labor Supply

"As an indication of the progress which is being made in expanding the shipbuilding capacity of the country, permit me to say that the tabulated reports received from the various shipbuilding companies for the nine weeks beginning with Oct. 6 show that out of 109 plants reporting the total number of employes for the week ending Oct. 13 was 102,769, for the week ending Dec. 8, 149,270, an increase of 45.2 per cent during nine weeks. It must be borne in mind that all the shipbuilding effort is not confined to shipyards, but that a very large portion of the propelling machinery, winches, steering gears and other accessories are built in manufacturing establishments of the various industrial districts of the country, and these establishments are contributing thousands of operatives to the very respectable totals above given.

"This increase in labor employed is not due to the completion of new yards alone, but indicates the success we are having of adding a second and even a third shift to existing shipyards which formerly were running only a single turn. We are thus tremendously intensifying the output of existing facilities in addition to the construction of new facilities wherever conditions and the capacity of the men behind the proposition justify it.

"In an organization that must be rapidly expanded to take care of rapidly increasing needs there must of necessity be sufficient elasticity and, if need be, change so that the organization will be made responsive to the demands made upon it. As the pressure on our organization has increased, we have subdivided functions and added departments, and we are at present engaged

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in a further scheme of expansion so that annoying delays and errors of the past may be avoided in the future. Such organization as is being added contemplates largely a more direct supervision of the material and labor supply and has for its object the co-ordination of both to the general plan of construction which we have in mind, so that the greatest possible output of the existing and shortly to be added facilities will be permitted.

"The task of the Emergency Fleet corporation is not only the construction of new ships, but more particularly the fabrication of new facilities and the construction of new yards in which new ships could be built. It is only fair to state that with the tremendous expansion of the industry with the relatively few experienced organizations available, and the relatively small number of experienced workmen heretofore employed in our shipyards, some time must be granted for the proper expansion and development of the necessary labor and directing forces to man the newly created facilities. Time is necessary in the case of any organization both for the gathering of the necessary experience and for the development of the necessary team spirit so essential to successful operation, and it is hardly fair, therefore, to say that the newly created facilities shall from the very day they have been put into operation produce ships at the maximum capacity.

"According to the figures of the construction department of the Emergency Fleet corporation 1427 ships of 8,573,108 deadweight tons are under construction and under contract. Of these, 431 ships of 3,056,000 tons were already under construction or under order by private or foreign owners when the commandeering order went into effect on Aug. 3. The new tonnage of steel ships ordered is represented by 559 ships of 3,965,200 deadweight tons. The wooden ships for which contracts have been placed represent 379 bottoms of 1,344,900 deadweight tons and there are in addition 58 composite ships of 207,000 deadweight tons.

"The output of the various yards will increase progressively as experience grows and man power is increased. This is a well known fact in the growth of every new industry and it is idle, in making predictions of the coming year's ship production, to lose sight of the greatly augmented production which the newly created facilities and growing experience will bring about. Since the requisitioning order went into effect on Aug. 3, 49 vessels of a total of 300,865 tons have been put into service.

Complete Data on Ships Ordered by Emergency Fleet Corporation

STEEL SHIPS

Company	No. ships	Total tonnage	Total cost	Cost per ton
Merrill Stevens Co.	4	24,000	$3,864,000	$161.00
Los Angeles Shipbuilding Co.	8	70,400	10,883,840	154.60
Skinner & Eddy Corp.	6	52,800	8,400,000	159.09
Seattle Cons. & Dry Dock Co.	10	75,000	13,125,000	175.00
Moore & Scott Iron Works..	10	94,000	15,022,516	159.81
Baltimore Shipbuilding Co....	8	70,400	11,123,200	158.00
Downey Shipbuilding Co.	10	75,000	11,625,000	155.00
Sun Shipbuilding Co.	4	40,000	5,684,000	142.10
Western Pipe & Steel Co....	8	70,400	10,824,000	153.75
Groton Iron Works.	6	52,800	8,184,000	155.00
Saginaw Shipbuilding Co.	6	21,000	3,360,000	160.00
California Shipbuilding Co...	3	18,000	2,728,320	151.41
*American International Corp.	50	375,000	57,750,000	154.00
*American International Corp.	70	560,000	115,500,000	206.25
*Submarine Boat Corp.	50	250,000	39,375,000	157.50
*Submarine Boat Corp.	100	500,000	75,600,000	151.20
*Merchant Shipbuilding Corp.	40	360,000	54,776,320	152.15
Newburgh Shipyard	4	36,000	6,177,000	171.60
Los Angeles Shipbuilding Co.	10	88,000	15,136,000	172.00
Jahneke Shipbuilding Co.	6	30,000	4,950,000	165.00
Hampton Roads Dry Dock & Shipbuilding Co.	4	29,200	4,818,000	164.68
Federal Shipbuilding Co.	10	96,000	15,500,000	161.46
Oscar Daniels Co.	10	95,000	15,349,000	163.00
Erickson Engineering Co.	10	94,000	15,980,000	170.00
Bayles Shipyard.	4	20,000	3,300,000	165.00
Patterson-McDonald Co.	8	70,400	11,968,000	170.00
American Shipbuilding Co.	6	21,300	4,235,000	198.84
American Shipbuilding Co.	34	120,700	24,820,000	205.63
Southern Shipbuilding Co.	16	120,000	19,440,000	162.00
Pacific Coast Shipbuilding Co.	10	94,000	15,792,000	168.00
Pensacola Shipbuilding Co.	10	90,000	14,580,000	162.00
Groton Iron Works.	12	112,800	18,048,000	160.00
Atlantic Corp.	10	88,000	14,080,000	160.00
Totals	557	3,914,200	$651,627,046	$166.48

*The Emergency Fleet Corp. has extended financial aid in expanding yards.

WOODEN HULLS

Company	No. ships	Total tonnage	Total cost	Cost per ton
McEachern Ship Co.	10	35,000	$2,800,000	$80.00
Hammond Lumber Co.	2	7,000	600,000	85.71
Heldenfels Bros.	4	14,000	1,200,000	85.71
Bantsler Shipbuilding Co.	6	21,000	1,800,000	85.71
Grays Harbor Corp.	4	16,000	1,260,000	79.75
Coast Shipbuilding Co.	4	14,000	1,200,000	85.71
Sanderson & Porter.	10	35,000	3,000,000	85.71
Maryland Shipbuilding Co....	6	21,000	2,100,000	100.00
Foundation Co.	10	35,000	3,000,000	85.71
Groton Iron Works.	12	42,000	3,600,000	85.71
Ship Constr. & Trading Co...	2	7,000	600,000	85.71
Hillyer Sperring Dunn Co...	4	14,000	1,200,000	85.71
Portland Ship Co.	4	14,000	1,200,000	85.71
Universal Shipbuilding Co....	12	42,000	3,600,000	85.71
McBridge & Law.	4	14,000	1,200,000	85.71
American Shipbuilding Co....	4	14,000	1,200,000	85.71
Tampa Dock Co.	4	14,000	1,200,000	85.71
Union Bridge & Constr. Co...	6	21,000	.....	.....
Gildersleeve Construction Co..	2	7,000	600,000	85.71
Lone Star Shipbuilding Co...	8	28,000	2,400,000	85.71
Johnson Shipyard Co.	3	10,500	900,000	85.71
Henry Smith & Sons.	8	28,000	2,400,000	85.71
Potomac Shipbuilding Co.	7	24,500	2,100,000	85.71
J. N. McCammon.	2	7,000	600,000	85.71
Hammond Lumber Co.	2	7,000	580,000	82.86
Alabama Shipbuilding Co.	2	7,000	600,000	85.71
Murnam Shipbuilding Co.	4	14,000	1,140,000	81.43
George A. Gilchrist.	1	3,500	300,000	85.71
Hodge Ship Co.	4	14,000	1,200,000	85.78
Southern Shipbuilding Co....	5	17,500	1,500,000	85.61
J. M. Murdock.	2	7,000	600,000	85.71
Midland Bridge Co.	6	21,000	1,800,000	85.95
United States Maritime Corp.	6	21,000	1,800,000	85.71
No. Caroline Shipbuilding Co.	2	7,000	600,000	85.71
Morey & Thomas.	4	14,000	1,200,000	85.71
Cumberland Shipbuilding Co..	9	31,500	2,700,000	86.34
L. H. Shattuck.	18	63,000	5,220,000	82.86
York River Shipbuilding Co..	8	28,000	2,396,000	85.57
Kruse & Banks.	6	21,000	1,740,000	82.85
Fulton Shipbuilding Co.	4	14,000	1,150,000	82.14
Freeport Shipbuilding Co....	1	3,500	300,000	85.71
Sommarston Shipbuilding Co.	4	14,000	1,200,000	85.71
Kelley Spear Co.	1	3,500	300,000	85.71
Meacham & Babcock.	2	7,000	580,000	82.85
Wilson Shipbuilding Co.	3	10,600	900,000	84.05
Beaumont Co.	4	14,000	1,120,000	80.00
Coos Bay Shipbuilding Co..	4	14,000	1,120,000	80.00
Housatonic Co.	10	35,000	2,775,000	79.28
Nilson & Kelche.	4	14,000	1,200,000	85.00
George F. Rodgers Co.	4	14 000	1,200,000	85.00
Seaburn Shipbuilding Co.	8	28,000	2,400,000	85.71
St. Helen Shipbuilding Co....	2	7,000	600,000	85.71
Benicia Shipbuilding Co.	2	7,000	600,000	85.71
Wright Shipyards	2	7,000	600,000	85.71
Feeny & Bremer.	1	3,500	300,000	85.71
Tacoma Shipbuilding Co.	4	14,000	1,200,000	85.78
Newcomb Lifeboat Co.	4	14,000	1,200,000	85.78
Grant-Porter-Smith-Guthrie Co.	12	42,000	3,600,000	85.71
Totals	298	1,045,000	$88,691,000	$84.87

WOODEN SHIPS

Company	No. ships	Total tonnage	Total cost	Cost per ton
G. M. Standifer Corp.	10	35,000	$5,000,000	$142.86
Peninsula Shipbuilding Co....	4	16,000	2,000,000	125.00
Sloan Shipyard	16	56,000	7,840,000	140.00
Traylor Mfg. Co.	10	35,000	5,000,000	142.86
Lake & Ocean Navigation Co.	1	3,500	450,000	128.56
National Shipbuilding Co.	12	56,400	7,560,000	134.40
Grant-Smith-Porter-Guthrie Co.	8	28,000	4,000,000	142.85
Meacham & Babcock Co.	4	14,000	2,220,000	158.57
Totals	65	243,900	$34,070,000	$139.69

COMPOSITE SHIPS

Company	No. ships	Total tonnage	Total cost	Cost per ton
Merrill Stevens Co.	12	42,000	$5,712,000	$136.00
Terry Shipbuilding Corp.	20	70,000	9,520,000	136.00
Supple & Ballin.	8	32,000	4,400,000	137.50
Kelly Atkinson Constr. Co...	18	63,000	8,100,000	128.57
Total	58	207,000	$27,732,000	$133.97

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Capital Now Flows to Shipyards

The Days of the "Dud" and of Lack of Public Interest Are Over—Uncle Sam is Backing Responsible Shipbuilders—Financing in Future is Assured

By Guy F. Creveling

"DUD" is the name soldiers on the west front have given to German shells which fall, but fail to explode. The same nickname might be applied to the nipped-in-the-bud shipbuilding boom of 1917 which, for a time, seemed to be growing into a bubble of threatening proportions. In the press of important world events, this nine days' sensation has passed almost into oblivion, existing now only in newspaper files and the memories of some disappointed men. The American public has reason to be thankful that this boom was a dud, for the concentration of the nation's shipbuilding energies in the most efficient effort possible is all-essential. As every one knows, American success in this war depends directly upon the number of ships America can build and build speedily.

Speculators vs. Ships

Scarcely had this country entered the struggle last April, when promoters and speculators, attracted by the alluring prospect of billions for ships, began a rush to the shipbuilding industry. It was a Klondike scramble, resembling in many respects the war-order boom of two years before. Some were men who had neglected the opportunities of 1915 and were determined not to be left again on a chance to pick up a fortune. Then there were some who had drawn a lucky number in the war-order game and thought their luck would hold. Others, again, were ordinary, dyed-in-the-wool promoters whose profession it is to be wherever the prospects of easy money are to be found. There were still others who really did know a ship from a wharf, but theirs is another story.

In less than eight weeks after this country declared war, shipbuilding companies were organized in the United States, having an aggregate authorized capital stock of about $121,000,000. This figure compares with a total of about $373,765,000 of such authorizations during the first three years and four months following the beginning of the European war. Thus, nearly one-third of the stock authorized for new shipbuilding companies in a period of 40 months appeared during April and May, 1917.

Some of the embryonic shipbuilders had strong financial backing, but others were less responsible. It was not unusual last spring to find that a $10,000,000 shipbuilding corporation had only a post-office box as an address. The presidents of some imposingly titled corporations had desk room with telephone service. Vague rumors began to arise in coast towns from Portland, Me., to Galveston, Texas, and from San Diego, Cal., to Seattle, finding their origin in the visits of mysterious strangers to the water fronts, strangers who departed with never a word concerning the motives of their strange missions. Presently, however, here and there a lively speculation in ocean frontage sprung up; land which had seldom been visited except by the winds and tides began to assume new interest in the eyes of natives.

New Capital Enters Marine Fields

SINCE the United States entered the war the figures of incorporation of shipping and shipbuilding firms have increased remarkably. The 1917 *incorporations of firms of this class have been far greater than those of any other year, not excluding the war years of* 1914-16. *By months the figures for* 1917 *are as follows:*

January	$2,475,000
February	30,525,000
March	12,975,000
April	29,395,000
May	47,490,000
June	84,025,000
July	19,020,000
August	19,038,000
September	5,100,000
October	9,650,000
November	4,850,000
December	6,960,000
Total	$271,503,000

Most of the new companies of the kind under discussion, bought, or at least optioned, a slice of beach. This was the initial step. They knew that it was customary for shipyards to be located in the neighborhood of water and felt that this done the rest of the way would be comparatively smooth sailing. They were advertising in the newspapers for experienced shipbuilding executives. The next step was to equip the yards. This step required, in the first place, money to buy machinery; and in the second place, machinery for which to spend the money.

At this juncture, the prospective shipbuilders felt they would be justified in asking financial assistance from the government and thought it would not be much more than a matter of reaching forth their hands to pluck a juicy contract. But first they had to prepare their figures on costs and prices. This task proved difficult for some of the new companies for they did not know what kind of equipment would be required.

Letters began to pour into the offices of machinery sellers, asking for prices and delivery dates on punches, shears, bending rolls, hydraulic equipment, and the like. Some letters stated specifically what was wanted. Others did not. In some cases the inquirer confessed his ignorance of things maritime by asking the machinery sellers to prepare a list of specifications for shipyard equipment and then to name prices and deliveries! Frequently the machinery seller quoted as requested and received a reply stating that the order would be held up temporarily pending consummation of arrangements with the government. Many of these arrangements have not been completed and never will be. Sometimes the machinery seller's quotation letter elicited—not an order—but a request for a subscription to the stock of the new company!

Government Had to be Shown

After the budding captains of industry had compiled their figures, they began an attack on Washington. At about this time the Denman-Goethals controversy was nearing its bitterest stages and a great many of the speculators favored the Denman cause, possibly because the prospect of building wooden ships seemed less formidable than the idea of constructing massive steel carriers. Possibly, too, they did not like the Goethals way of doing business.

When they got to Washington, they found their task was no sinecure, after all. Even the most optimistic found it harder than they had expected to pull the wires which would swing the United States shipping board and the Emergency Fleet corporation. The latter body was not passing out contracts to everyone who called. It demanded to be shown. It expressed a preference for awarding contracts to companies which showed signs of being able to fulfill those contracts. It insisted upon financial responsibility, which doomed the hopes of some.

Where a man showed that he had real ability and experience, it was not difficult for him to get financial backing,

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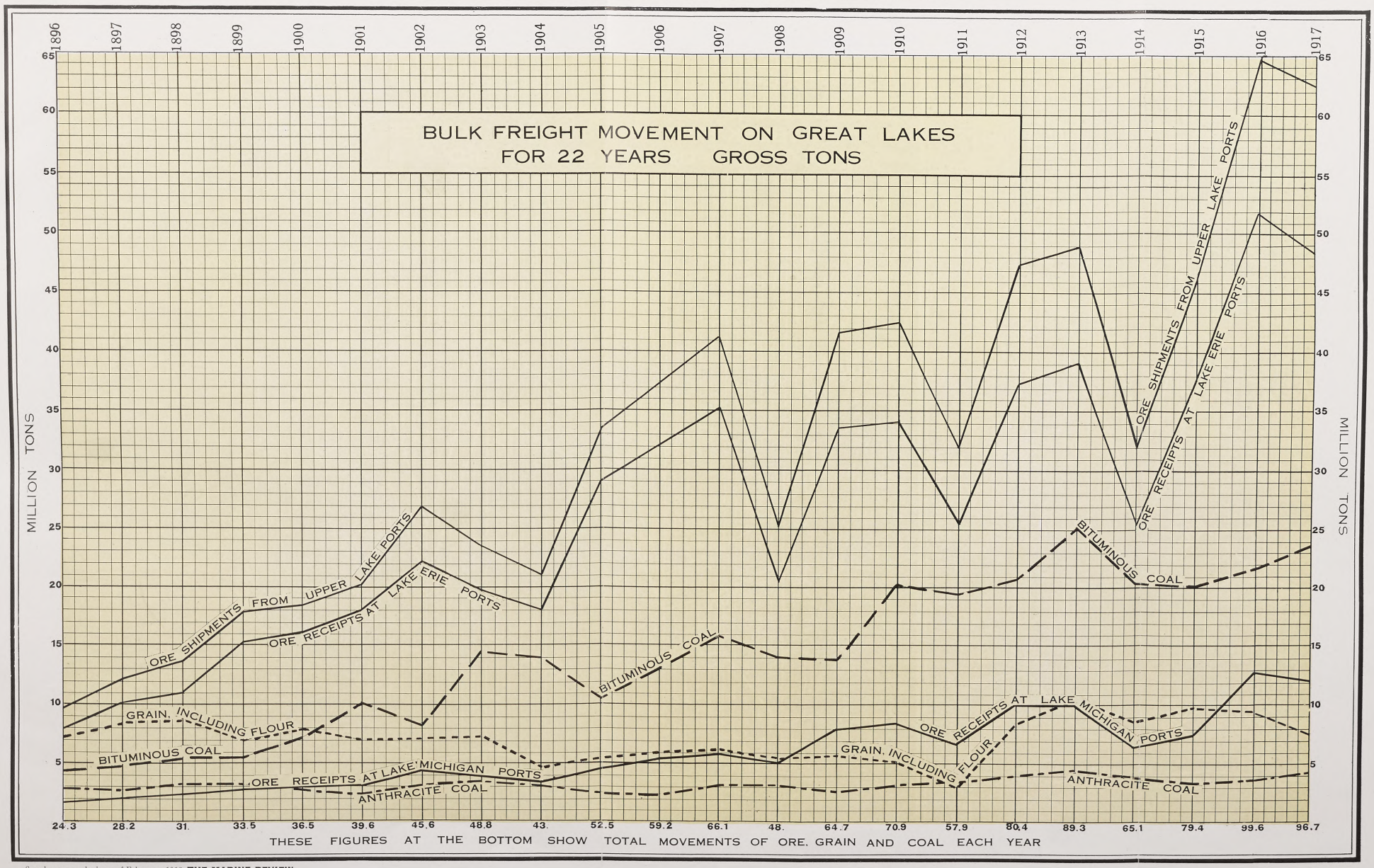
THE MARINE REVIEW


BULK FREIGHT MOVEMENT ON GREAT LAKES
FOR 22 YEARS GROSS TONS
1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917
MILLION TONS
65 60 55 50 45 40 35 30 25 20 15 10 5
ORE SHIPMENTS FROM UPPER LAKE PORTS
ORE RECEIPTS AT LAKE ERIE PORTS
BITUMINOUS COAL
GRAIN, INCLUDING FLOUR
ORE RECEIPTS AT LAKE MICHIGAN PORTS
ANTHRACITE COAL
24.3 28.2 31. 33.5 36.5 39.6 45.6 48.8 43. 52.5 59.2 66.1 48. 64.7 70.9 57.9 80.4 89.3 65.1 79.4 99.6 96.7
THESE FIGURES AT THE BOTTOM SHOW TOTAL MOVEMENTS OF ORE, GRAIN AND COAL EACH YEAR

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and such men made progress with the officials of the Emergency Fleet corporation. Agents of the government made quiet investigations and contracts were awarded with scrupulous care. In fact, the government acted with too much caution in some respects, at a time when ships and not money were the prime necessity. Men who showed they could build ships and were responsible, were kept cooling their heels for two months of the best time of the year to build ways and lay railroads, while Admiral Capps, former general manager of the Fleet corporation, was trying to whittle down expenses. So what chance had those who were not able to prove that they had the goods? Numbers left Washington, sadder but wiser, and since have exercised their talents in more promising fields than the shipbuilding industry. A few mistakes were made, for it was no easy task for the Fleet corporation to separate the wheat from the chaff and some companies will not be able to keep even approximately the promises as to deliveries they have made in their contracts.

Difficulties in Getting Tools

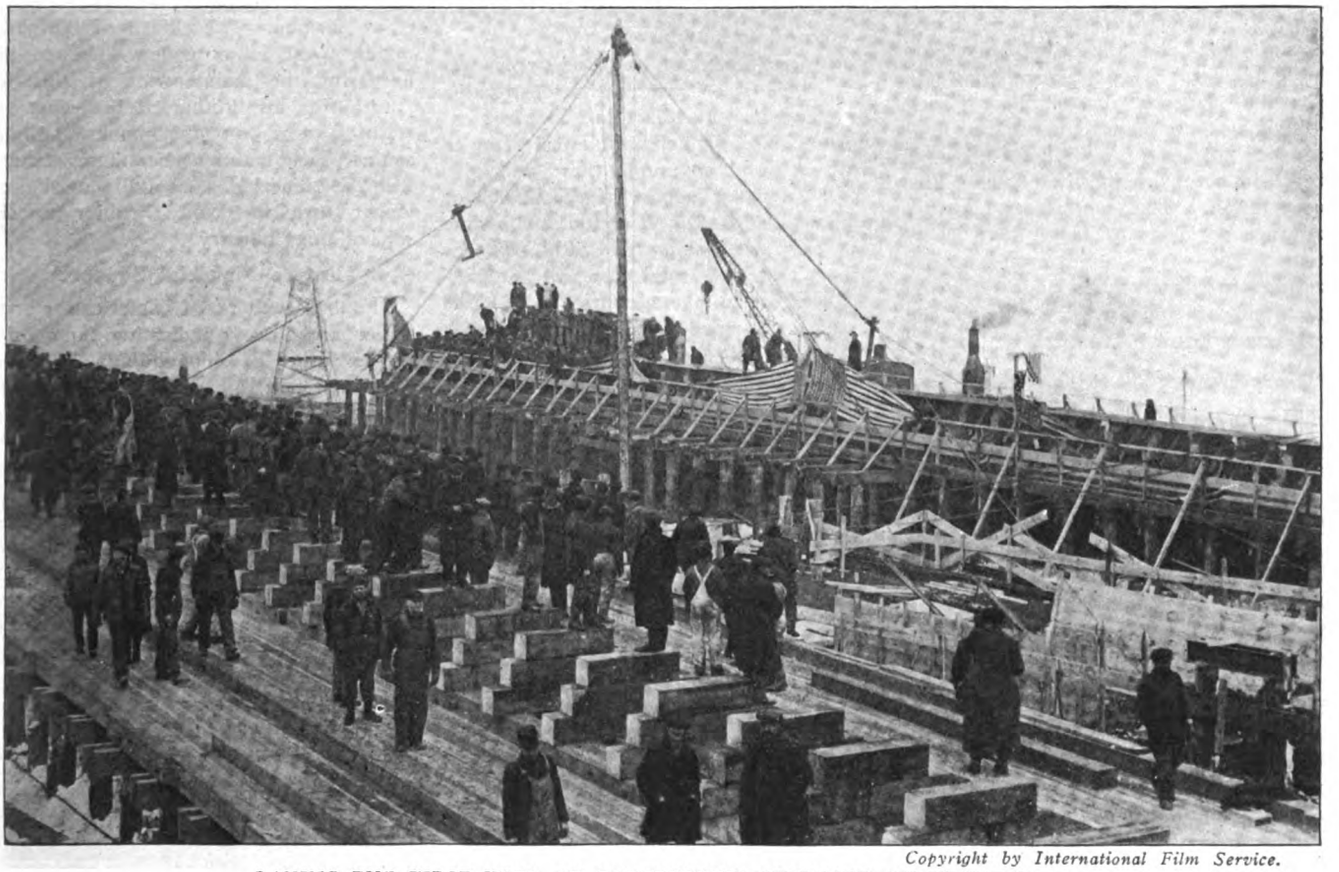
A contract was placed with a Pacific coast company, calling for a certain number of steel ships. The company possessed only a stretch of beach and a dream—and some responsible men in its management. But it promised to begin deliveries within 10 months after date of contract. A representative of the new company went to New York to buy machinery. There he found that he would not be able to obtain all the equipment necessary until after the time his company had promised to deliver the first boat. Much upset, he went to Washington for aid, and a leading machinery builder, already booked to capacity with emergency war work, was ordered by the government to set aside some of these orders and rush out tools for the projected shipyard. This was late in May, when our war preparations along other lines were beginning to strain the facilities of machinery builders. Later a system of priorities was established by the government relative to machine tool deliveries and it is no longer possible for a cargo shipbuilder to obtain preference of deliveries of machine tools over some other branches of war preparation.

A number of cases like this were, of course, inevitable, for it was necessary to create many new yards and to expand existing facilities. The adoption of the standardized steel ship program, first indorsed by Major General Goethals when he was manager of the Fleet corporation, effected sweeping economy in the use of machinery. Existing facilities of bridge and structural shops being utilized in this program, the construction of the three gigantic government yards has demanded principally equipment needed for assembling the finished parts. This program played a prominent part in ringing the knell of the shipbuilding speculators, for it gave assurance of a maximum tonnage with a minimum number of yards, whereas the speculators had expected a shipyard to spring up on almost every available piece of waterfront.

Many New Yards Get Orders

Data recently presented by Chairman Edward N. Hurley of the shipping board, in the senate investigation of the shipbuilding program, shows how many new yards were selected for contracts by the Emergency Fleet corporation out of the hundreds which were born in the excitement of early war time. Mr. Hurley stated that contracts have been let to 110 shipyards, of which 58 existed on Jan. 1, 1917. In addition the Fleet corporation requisitioned vessels building in 22 yards, so that at present it is controlling work in 132 yards, of which 58 are old and 74 are new. Of the 58 yards 18 were considered of prominence when this country entered the war. Seventy-four companies were the pick of the hundreds of proposals that came before the Fleet corporation.

The creation of the new yards and the expansion of the old ones, together with necessary increases in the capacities of manufacturers of ship equipment, from marine engines to anchors, have entailed, of course, the expenditure of hundreds of millions of dollars.



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LAYING THE FIRST KEEL AT GOVERNMENT SHIPYARD ON NEWARK BAY

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Where necessary, the Emergency Fleet corporation is extending financial assistance. Mr. Hurley states that such help is being given in the case of 42 yards. Usually this assistance takes the form of advances on contracts ranging from 10 to 30 per cent of the value of the contract. The money expended on the three government assembling yards to Dec. 1 was $9,651,000.

The government maintains a balance of from $1,000,000 to $1,250,000 in banks for the account of each of the contractors who are constructing these government yards. The Submarine Boat Corp. is contractor for the plant in Newark bay. The American International Corp. is contractor for the yard at Hog Island, Pa., and the Merchants Shipbuilding Corp. is government contractor for the plant at Bristol, Pa. Checks drawn by these contractors on the funds at their disposal are countersigned by representatives of the Emergency Fleet corporation. The contractors, in turn, advance payments of from 10 to 30 per cent to the various subcontractors, such as the structural shops and the manufacturers of engines, winches, and general equipment.

Percentage of Profit Allowed

The question of price, which held up the standardized ship project for two months during the administration of Admiral Capps, was finally settled on this basis: A basic cost was determined, to include the cost of constructing yards and ships; the contractors to be allowed a percentage of profit over the actual cost of the construction as their fee, subject to penalty in case the actual cost exceeded the basic cost by too wide a margin. But a minimum fee is guaranteed, so that the contractor is sure of some return even if the actual cost exceeds the basic cost by a wider margin than provided, excepting in the case of gross carelessness. On the other hand, a system of bonuses has been instituted so that if the actual cost is lower than the estimated basic cost, the contractor will profit accordingly. The minimum fee to the contractor would be about 3 2/3 per cent of the basic cost. The normal fee would be about 5½ per cent.

The American International Corp. has contracts for 120 steel ships whose cost is placed at $173,250,000. On the basis of the minimum fee of 3 2/3 per cent, this company's profit would be about $6,000,000. Admiral Bowles, of the Emergency Fleet corporation testifying in the senate investigation, stated that the American International Corp.'s profit would be about $6,000,000. When asked what it was supplying in return for this sum, since the government furnishes capital and material, Admiral Bowles replied that the corporation was supplying the organization and the "know how." After the war, the value of the yards will be appraised and the contractors will have the option of buying them. If they do not care to do so, the yards will revert to the government as salvage. The American International Corp. owns the site of the Hog Island, Pa., plant, valued at $2,000,000. If this plant reverts to the government the $2,000,000 will be paid the company. The Submarine Boat Corp. has a 14-year lease on its site. The Merchants Shipbuilding Corp. owns part of the site at Bristol. Part is leased by the government. There are said to be some legal tangles in this matter that will have to be straightened out later.

According to figures of the construction department of the Fleet corporation, 1427 ships are under construction or contract. Of this total, 58 are composite ships, which are steel framed with a wood covering; these will give 207,000 tons at a cost of $27,732,000 or an average of $133.97 a ton. The data on 557 steel ships of 3,914,200 tons shows that their total cost will be $651,627,046, or an average price of $166.48 a ton. Of wooden ships complete with machinery, 65 are contracted for, totaling 243,900 tons at a total cost of $34,070,000 or an average ton cost of $136.69.

The investment public at large has not been called upon to finance this gigantic work. The money bags of Uncle Sam have been paying out the cash. Some private capital is being employed, but the amount is small for the volume of business. Prior to the war, the shipbuilding industry was only a stray dog in the financial field. Private capital shunned the industry. It would have been almost as easy to sell stock in a midatlantic gold mine as to finance a new shipbuilding venture. The investor put a mental stamp "gold brick" upon any suggestion that he invest his money in a shipyard. There were reasons for this condition. Adverse legislation devised by provincial lawmakers, who could not grasp the importance of a merchant marine, had almost stifled the industry. There were a few old established coast companies, for the most part closely held and conservatively managed, which were able to eke out an existence from the meager demand for American-built cargo ships together with an occasional slice of the government's naval programs. The industry plodded along, launched its half million deadweight tons of shipping a year and the stars and stripes were gradually becoming as extinct in many ports as the great auk.

But the war has changed all this. America once more raises her head among the leading maritime powers. If the struggle continues as long as some prophets predict, more ships will fly the stars and stripes than any other emblem. The supremacy won in the Napoleonic wars and lost in the civil war, after 50 years is being regained. But this supremacy, once regained, must be retained. The shipping and shipbuilding industry must have the good will and support of the entire American public. It must have the financial support of the investment public, for some time peace will return and business will be diverted to normal standards. Then capital will no longer have reason to shun the shipbuilding field.

The importance of an American merchant marine as a national institution has been brought home to the American people these last nine months in a decisive fashion. The citizen of the great middle west is as wide awake to the need for the maintenance of this institution as his brother of the coast. If statutes now on the books militate against such maintenance, these statutes will be repealed. Capital need no longer turn the cold shoulder to the shipbuilding industry.

Future Financial Support

The bell-wethers of American money power are already indicating their faith in the future of shipbuilding. There is the American International Corp., with the hundreds of millions of the National City Bank of New York, behind it. There is the mighty strength of the Harriman interests in the Merchants and Chester Shipbuilding companies. There is the United States Steel corporation, with its tremendous resources, backing the Federal and Chickasaw Shipbuilding companies. There is the powerful Bethlehem Steel corporation with its merger of five big shipbuilding plants. Then there are scores of others of prestige and influence which are bending their backs to the task of rehabilitating our shipbuilding industry. Their efforts will not cease with the winning of the war, for their interest in this field has been aroused as never before. With such leaders, the financial future of the American shipbuilding industry is assured.

Japanese Company to Build More Ships

The following from the *Japan Chronicle* is given out by Consul General Scidmore at Yokohama. The Nippon Yusen Kaisha authorities are reported to plan an increase in the subscribed capital of the company from 44,000,000 yen ($21,934,000) to 100,000,000 yen ($49,850,000). The company intends to build 50 vessels, principally freighters. These vessels will aggregate about 400,000 tons. The plan is said to be based on a permanent subsidy from the Japanese government. The plan is designed to prepare the company for after-the-war competition.

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Former German Liners at New York—All Are Now Repaired and Sailing Under the Stars and Stripes

A Counter Attack on German Vandalism

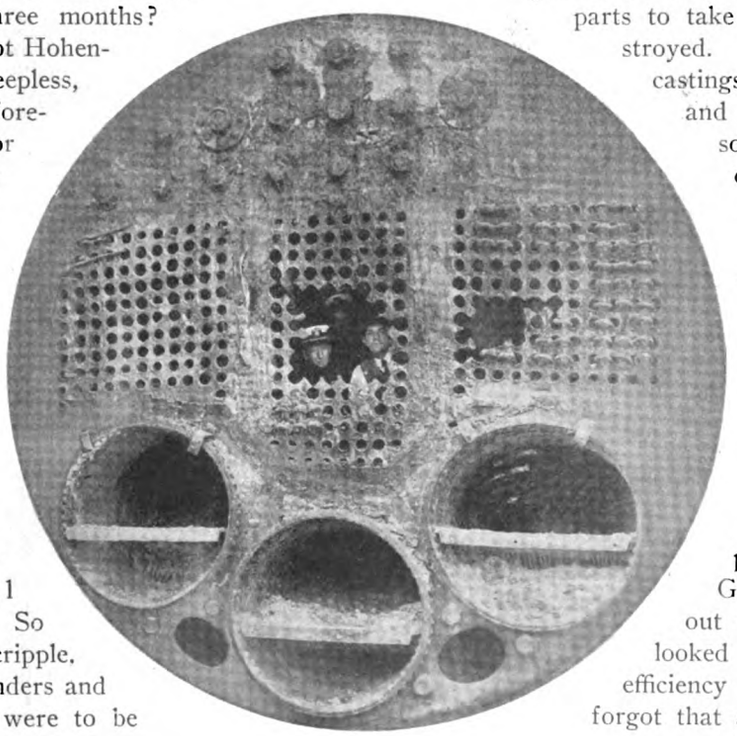
TO all *unterseeboote* commanders: "After Feb. 1 resume unlimited submarine warfare in the barred zones, according to previous instructions."

To the commander of the interned fleet in North America: "Unlimited submarine warfare has been proclaimed. The United States may join with our enemies. She must be prevented from using our ships. *Vorwaerts mit ihren schlageln!* Spare not a single vessel."

Such in effect were the orders spat out from the powerful German wireless station at Nauen a little less than a year ago.

The submarines were loosed. What booted it if America joined the Allies? Would not the war be won in three months? And meanwhile, would not Hohenzollern efficiency, sleepless, painstaking, invincible, forestall any Yankee plans for utilizing the five score or more vessels of the Fatherland interned in American harbors? The plan was simple. The interned ships would be put out of action for the duration of the war. Even Prussianism shrank from their total destruction. They would be needed too soon for the great commercial struggle after the war. So the orders went forth to cripple, but not to destroy. Cylinders and other vital engine parts were to be wrecked, while in the meantime German foundries provided new castings from patterns which they had in readiness for just such an emergency.

For a time events moved smoothly and according to schedule. While neutrality guards policed the piers, Prussian wreckers labored and cursed in the bowels of the interned steamers. For weeks drills were busy; hack saws were active; and battering rams, more ingenious than those rigged before the walls of Carthage, bludgeoned their way through massive and intricate castings. At the same time in pumps and boilers, in fire extinguishers and double bottoms, cunning German minds laid traps to foil American ingenuity. As the work of demolition proceeded in American harbors, German foundrymen paused in their war labors to make new parts to take the place of those destroyed. More than likely these castings were machined, finished and promptly shipped to some convenient port of debarkation, there to await the coming of peace. Thus only could all contingencies be provided for, and the great Prussian god, Efficiency, appeased.



A BOILER DRY-FIRED AND DESTROYED

But even though *Schrechlichkeit* feed on itself, its ends are not always accomplished. In this case the Germans reckoned without their host. They overlooked the difference between efficiency and effectiveness, and forgot that although some men may ruin, others can build. Nevertheless, when the

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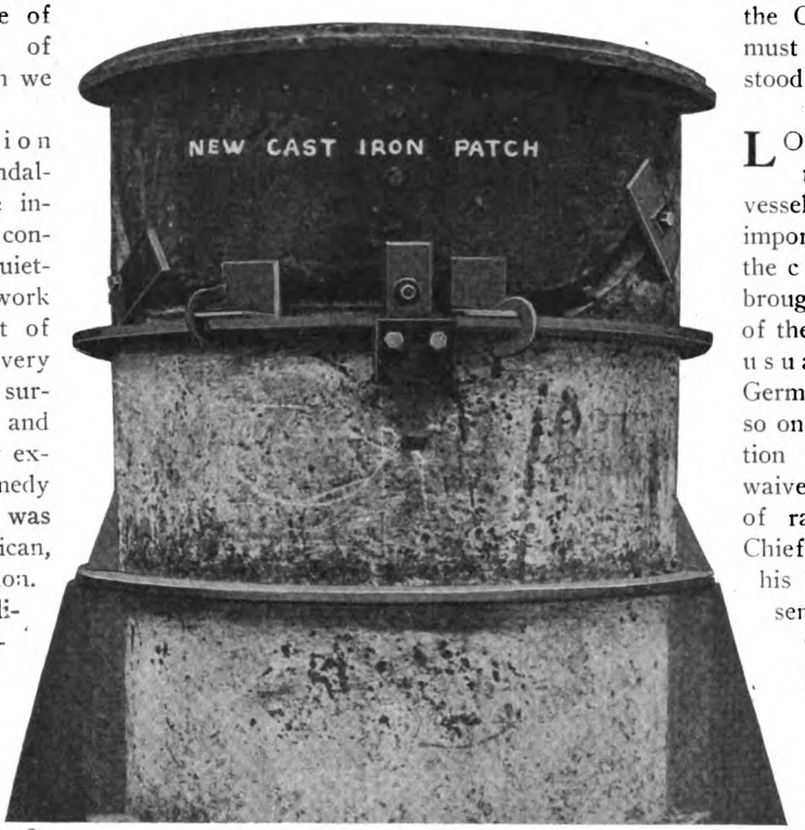
nation awoke to the fact that many of the German ships seized at the outbreak of the war had been systematically and methodically wrecked, the alarm was general and widespread. In April we were still under the spell of the Prussian efficiency bogey. "The eagle's wings have been clipped," sneered the propagandist. We believed him. We had been sold by the great German advertising campaign with its single slogan, "Invincibility". Visions of an army impotent spread through the country. The deathlike inertia of the shipbuilding program added to our uneasiness. It has always been so with the United States. We are unconscious of our strength and unaware of the vast machinery of production amid which we live.

So while the nation worried over the vandalism practiced on the interned steamers, vast constructive forces were quietly assembled and the work of bringing order out of chaos commenced. Every vessel was thoroughly surveyed and its mashed and broken bones critically examined. Then the remedy was prescribed. It was daring, original, American, suited to the situation. Under ordinary conditions, by methods dictated by the traditions of the ship repairing fraternity, at least 18 months would have been required to place the looted vessels again in commission. Meanwhile, Germany might have breached the western front. Fortunately, however, traditional methods were jettisoned. In their stead ideas new to the marine world were brought into play and as a result by Thanksgiving day all of the 109 German merchantmen that fell into our hands in April, freshly painted, refitted, repaired, reconstructed and in many cases vastly improved, were operating on the Atlantic under the American flag. Under the direction of American naval crews they are now bearing no inconsiderable portion of the traffic burdens of the war. As a matter of fact, the actual work of repairing the damage wrought by German vandals required but little over four months' time; no vessel was delayed for a single day as a result of Prussian vindictiveness. In every case the time necessary to repair the wanton destruction perpetrated by the German crews was less than that required for the ordinary fitting-out operations and for the work of converting the larger liners into transports.

In brief, in a great contest between destructive and constructive forces, the constructive organization won hands down. Prussian efficiency was beaten at its own game. American genius for big undertakings again proved its capacity. And herein lies a story that should be familiar to every patriotic citizen. Before it can be told in any detail, the nature and extent of the damage to the German steamships must be thoroughly understood.



Pieces were broken out of large cylinders and thrown overboard. It was necessary therefore to make a pattern to fit the break and then to cast a new piece, which was welded to the main body of the cylinder. This shows a cast iron patch ready for welding by the oxy-acetylene process. Special clamps are used to hold the patch securely in place for welding. This weld was not caulked and no anchor studs were used.

* * *

LONG months of idleness on the interned vessel, with nothing more important to do than wind the chronometer, had brought about a relaxation of the strict discipline usually maintained on German merchant ships, so on the morning in question Captain Werner waived the prerogatives of rank and sought out Chief Engineer Richter in his log room, instead of sending for him.

"I haf orders for you," the captain announced.

"Sehr gut," Richter rejoined, laying aside his carved meerschaum pipe. "It is time we got into the active service of the Fatherland. For nearly three years we have done nothing but pump out *der* bilges, while our brothers and all our friends are serving in the armies of the Kaiser. Even though we sink on the way over, we shall be doing something. When do we get up steam?"

"Never," said the captain. "We are not to run the blockade and be helplessly sunk or captured by those dogs of English. Our orders are much more subtle. The high command has seen fit to loose the U-boats. In three months, six at the most, England will be starved. Meanwhile America, nominally at least, may enter the war. Our ships must not fall into the hands of the Yankees, so our orders are to put them out of action for the period of the war."

"Let it be so," muttered Richter, although his dis-

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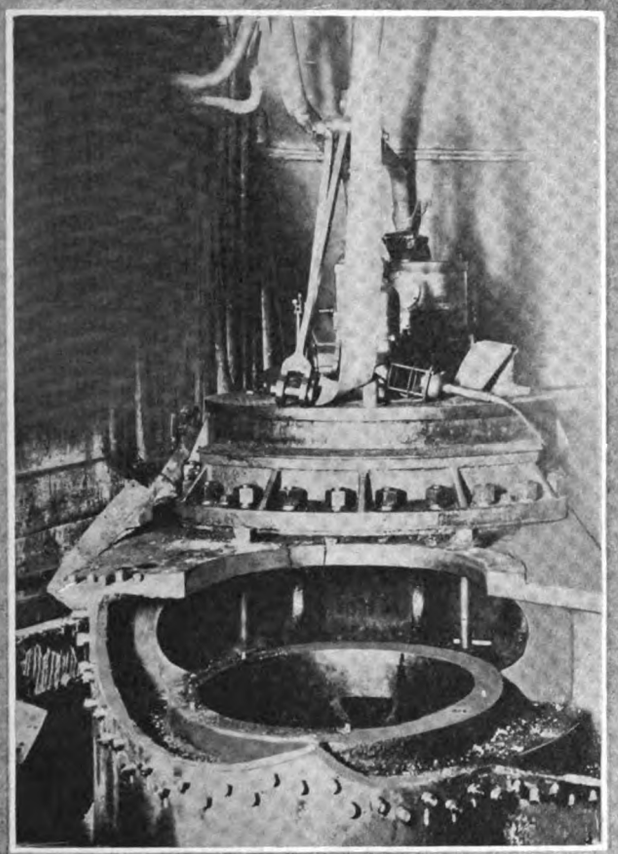
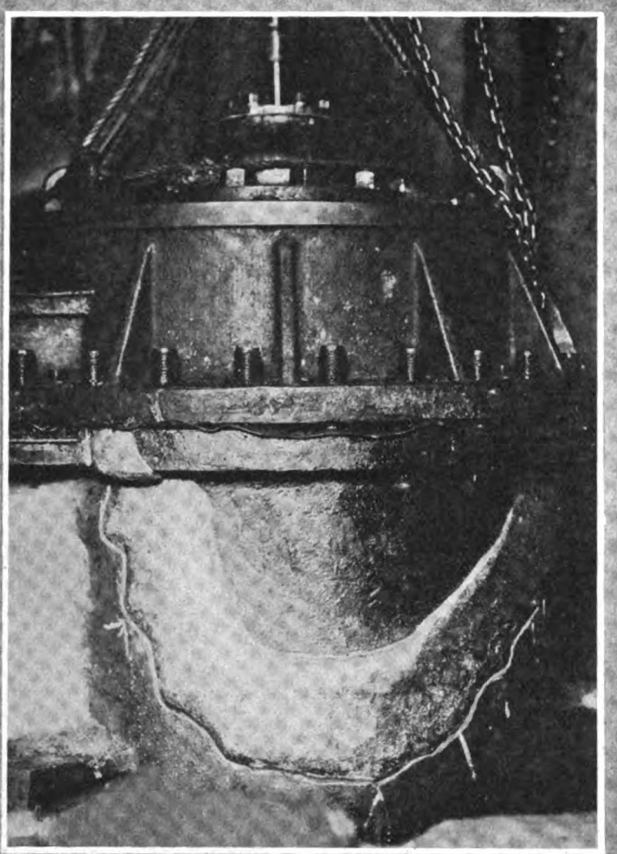
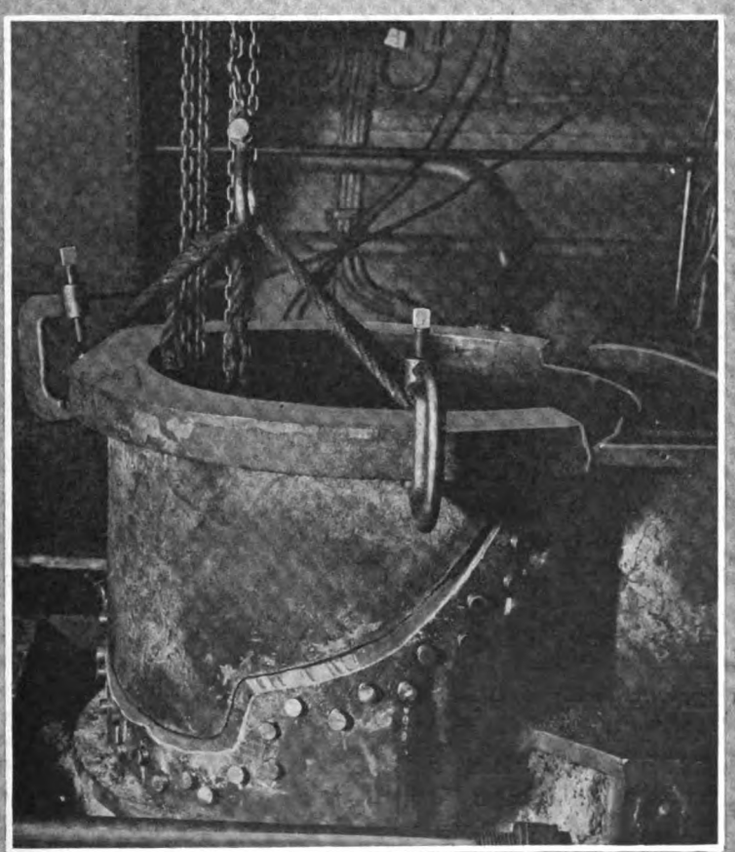




The electric welds usually were anchored by ⅞-inch steel studs screwed into the main portion of the casting along the line of the break. These studs were staggered and the welding metal threaded around them. The two illustrations at the top of the page show a high-pressure valve chest before and after repairing by electric welding.



Cast-steel patches were used on most breaks repaired by electric welding. The line of the weld was trimmed to a V-shape. The welding metal was laid on in layers, using steel welding wire and the arc welding process. Ingenuity was required in arranging the rigging and clamps holding the patch in place while the work was done.

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appointment was plainly evident, and his face fell.

"It is on you, *Herr* Chief," the captain continued imperturbably, "that most of the burden of executing these orders will fall. Certain vital parts of the engines and pumps are to be damaged beyond repair, so that by the time the Americans have made new designs, prepared the drawings, worked out the paterns and finished the castings necessary to replace the parts we are to demolish, the war will be over."

But Richter was thinking only of the machinery he had coddled, nursed and petted for years. "My poor engines," he murmured, "they have served me well. It is like shooting one's dog. A thousand times over would I risk death running the blockade."

The captain was disposed to humor his chief's whims.

"Don't worry," he soothed, "it's only temporary. Our world-encompassing, efficient system overlooks nothing. New castings will be ready for you when you need them."

He handed Richter a packet.

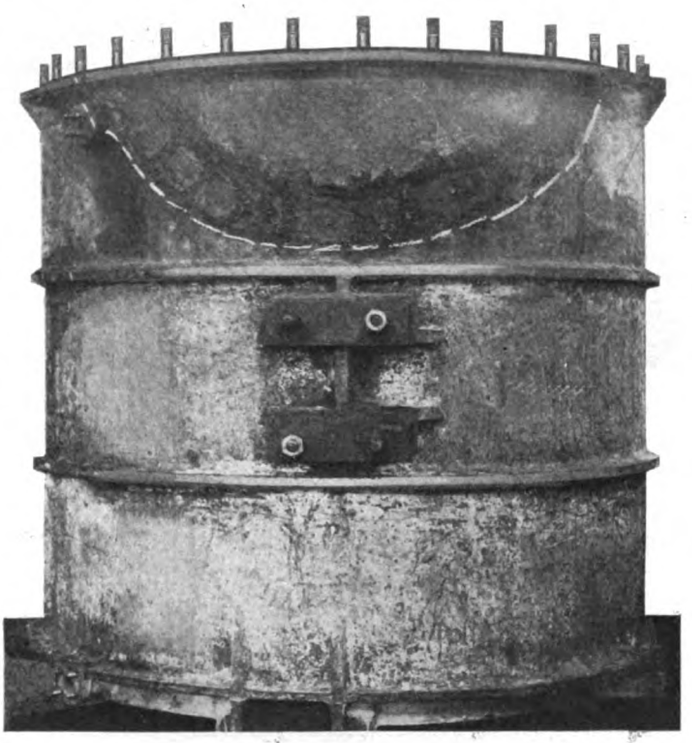
"Here are the orders. Execute them, for the Fatherland!"

A remnant of Richter's three years in the Germany army surged to the surface. He saluted.

"Zu Befehl, Herr Kommander!"

The captain departed and Richter undid the packet of orders. They were brief, but explicit.

"Immediately upon receipt of these instructions," Richter read, "you will commence the work of demolition, taking care to follow our directions accurately, so that the work of reconstruction at a later date may not be hampered. You will smash as large pieces as possible out of the following engine parts: Cylinders, steam nozzles, valve chests, cylinder liners, cylinder covers, and circulating pump casings. This can best be accomplished by first drilling the parts in question with a series of 2-centimeter holes arranged either in the form of a circle or a letter U. The holes should be as close together as possible, so the pieces will break out easily with a hand sledge. Throw the broken pieces overboard. If you have time, you also can crush the valve chests and cylinders by rigging a battering ram from your chain tackle. A piece of spare shafting will serve for a ram. Piston valves should be removed and thrown overboard. Disconnect the throttle valve also and throw it overboard. Smash the engine room telegraph. Remove the glands from the stern-tube stuffing boxes and strew them through the bilges, thus filling the stern-tube compartment with water, necessitating the docking of the ship. Finally, empty the boilers of water and dry-fire until the tubes are destroyed. Take care to so conduct your operations as to avoid suspicion. Broken pieces, valves, etc., that are to be thrown overboard should be discharged at night, not in the daytime. Do most of your work at night."



This illustration shows a large oxy-acetylene weld on the port low-pressure cylinder of the former German steamer RHINE. *The welding seam is* 80 *inches in length. No anchor studs were used on this weld. Slag and other impurities are worked out of the weld by manipulation of the torch aided by a flux. Welds such as this have shown a test efficiency of* 100 *per cent.*

Richter turned to the speaking tube that led down into the engine room.

"Send up Schlamacher," he ordered.

When his assistant had appeared he read him the orders for the destruction of the machinery.

"You will proceed at once," Richter concluded, "and be careful to follow the instructions explicitly. I shall oversee your work myself."

Before long the grinding of drills and the crashing of sledges against metal was mingled with stout German oaths throughout the after portion of the ship. The wreckers were at work.

* * *

ALTHOUGH cast in the form of fiction, the foregoing fragment of narrative describes accurately the more obvious forms of destruction inflicted on the interned German merchantmen in American harbors between the resumption of unrestricted submarine piracy on Feb. 1 and our declaration of war early in April. On the latter occasion, 103 German vessels of all types resting in American harbors were taken over by the authorities of the United States. Since then six more have been added to the list, making a total of 109 vessels now carrying the stars and stripes in place of the black, white and red ensign of the Kaiser. Fully 50 of these ships, when seized by the American authorities were found to have been more or less damaged in accordance with the plan detailed in the foregoing.

The boats along the Atlantic coast in the vicinity

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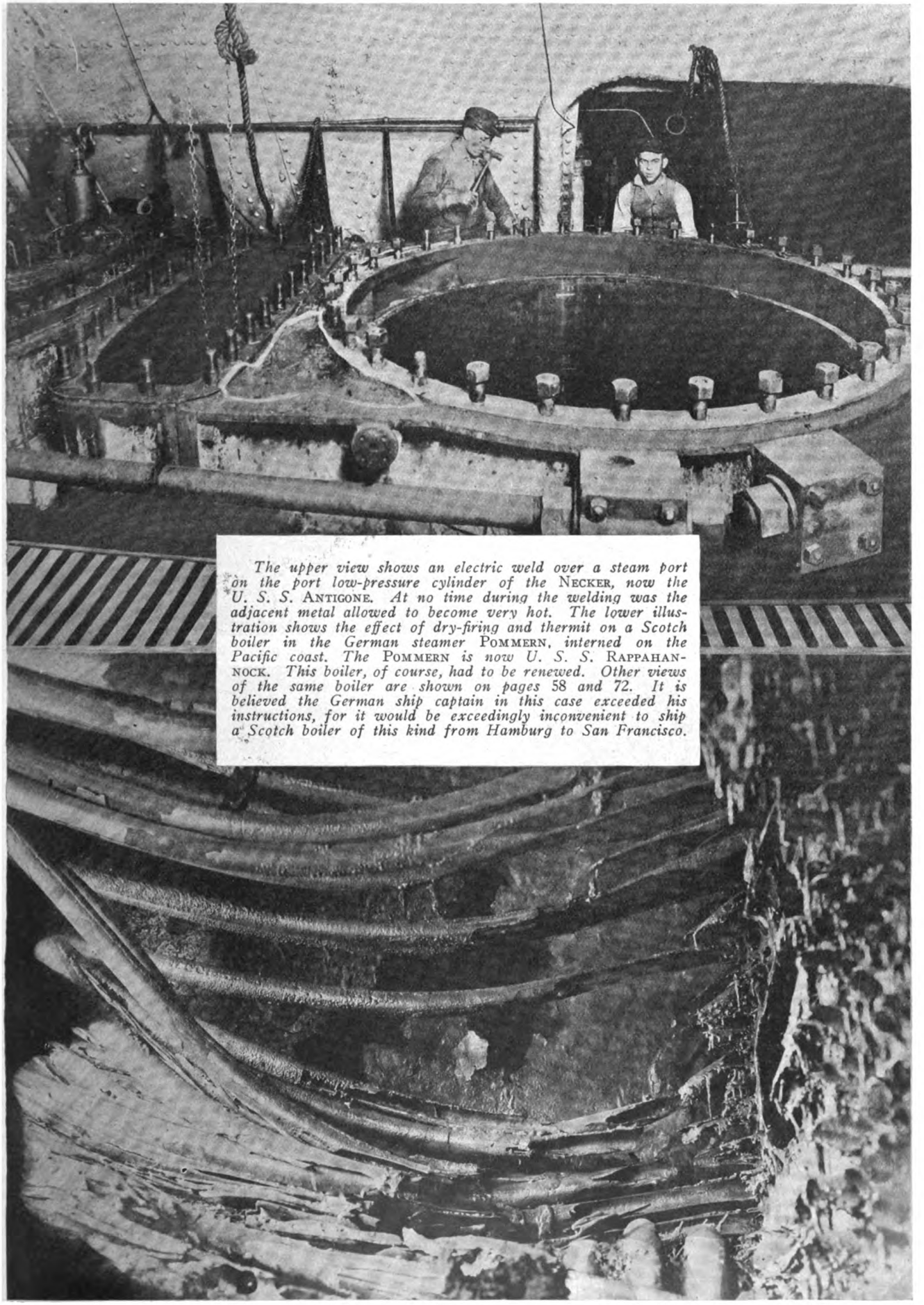

The upper view shows an electric weld over a steam port on the port low-pressure cylinder of the NECKER, *now the U. S. S.* ANTIGONE. *At no time during the welding was the adjacent metal allowed to become very hot. The lower illustration shows the effect of dry-firing and thermit on a Scotch boiler in the German steamer* POMMERN, *interned on the Pacific coast. The* POMMERN *is now U. S. S.* RAPPAHANNOCK. *This boiler, of course, had to be renewed. Other views of the same boiler are shown on pages* 58 *and* 72. *It is believed the German ship captain in this case exceeded his instructions, for it would be exceedingly inconvenient to ship a Scotch boiler of this kind from Hamburg to San Francisco.*

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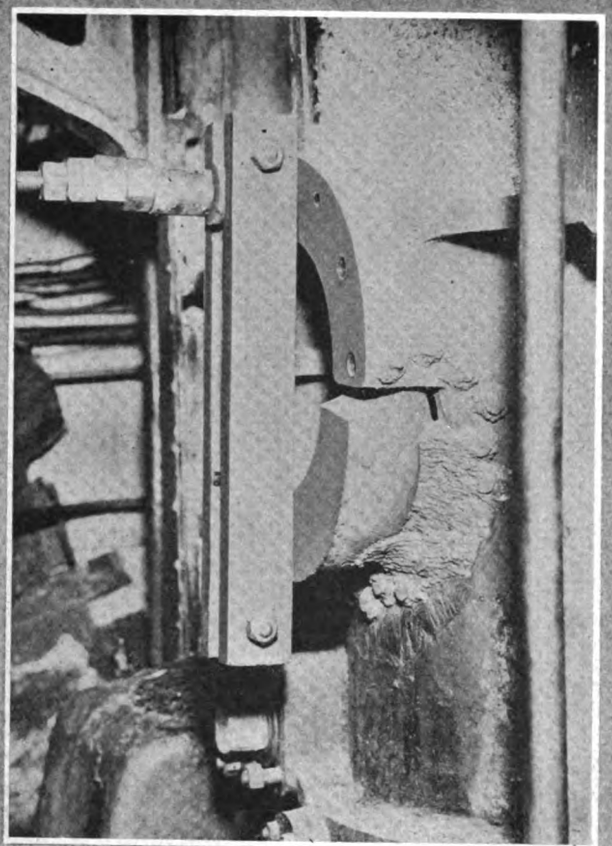
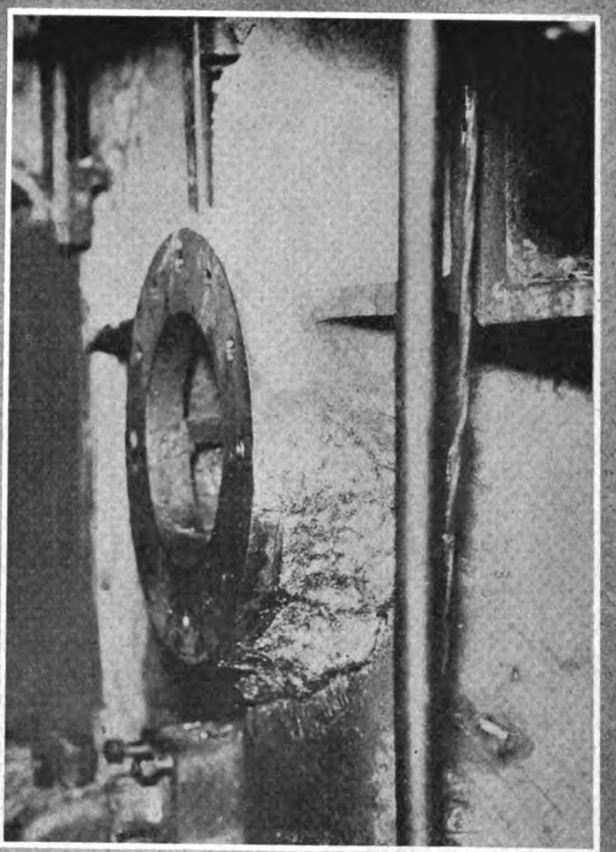
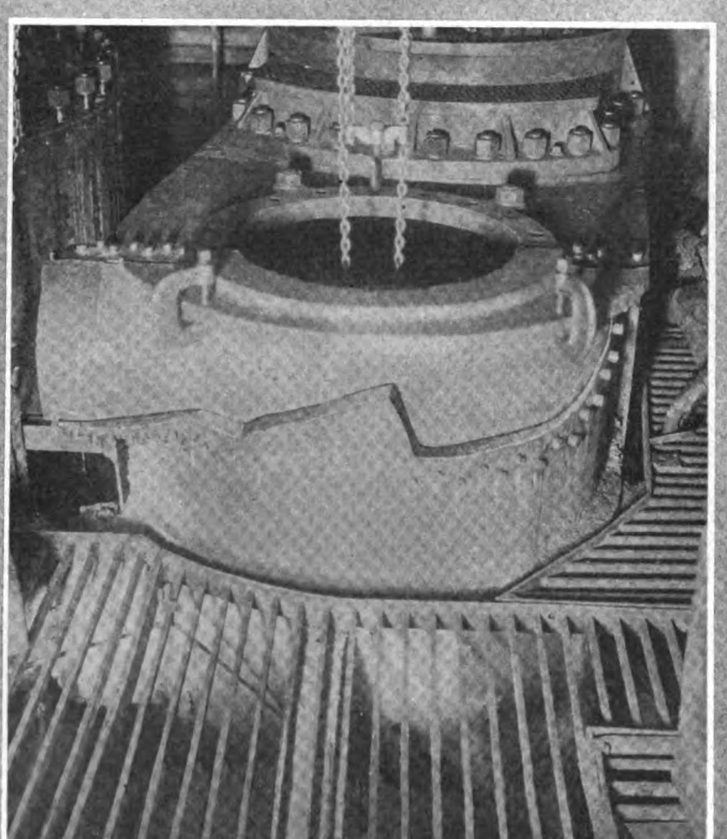




Many steam nozzles were broken. They were repaired by electric welding by the method illustrated at the top of this page. Special clamps were designed to hold the parts together while being welded. The cord-like structure of the weld is clearly shown at the left, while the view at the right shows the effect of peening or caulking.



The view at the left shows the break in the first intermediate pressure valve chest of the Princess Irene now the U.S.S. Pocahontas. The cast-iron patch has been fitted ready for welding. Many saw-toothed breaks such as this were repaired by electric welding. Special efforts were made to avoid overheating which induces shrinking and cooling strains in the weld. The success of the weld depends in a large measure on the skill of the workman.

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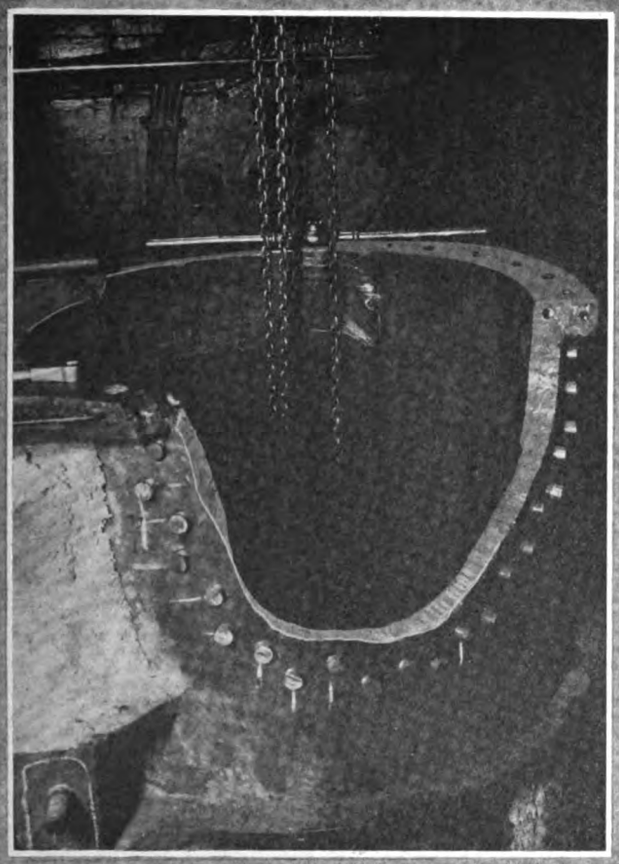

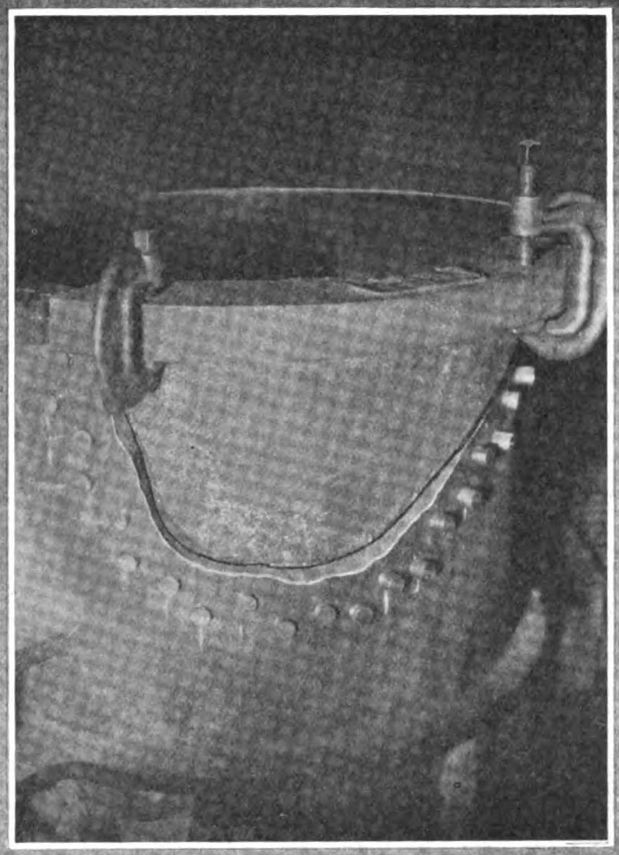

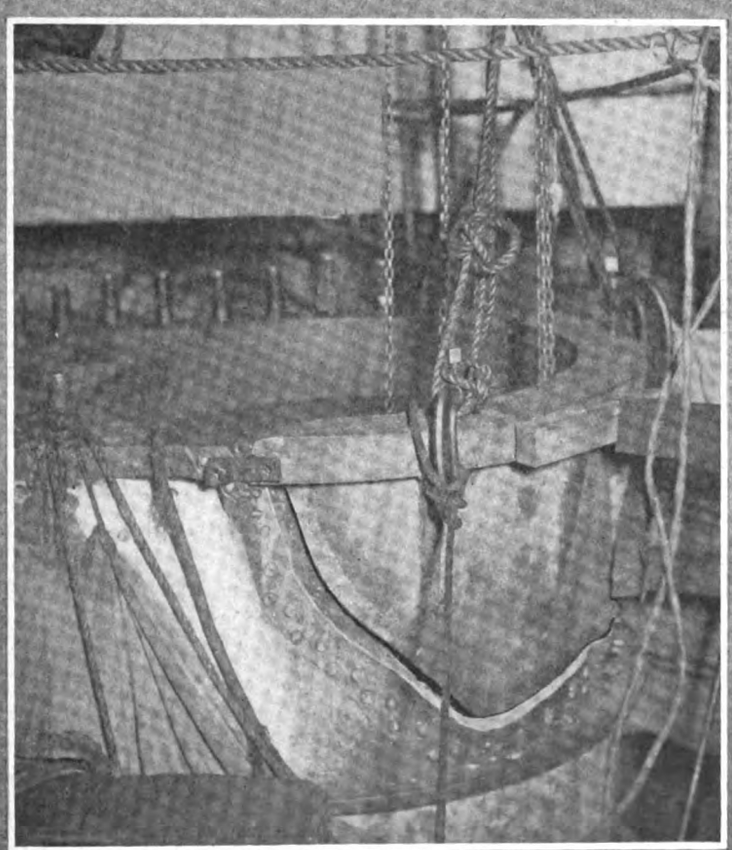

The view at the right shows the elaborate rigging and blocking necessary to secure the patch in place prior to welding. The preparation of the weld is half the battle. With the patch in place and the edges of the weld properly chamfered the arc welding proceeds by first building up the edges of the V-slot from one end to the other and then filling in between these steel-plated surfaces with the welding material.

Where feasible, anchor studs are placed in the face of the weld as shown at the left. When the weld is finished the whole surface is gone over with an air caulking tool. This has been found to be very important in electric welding. Hard spots are disclosed and porous sections closed up by the peening process. Peening is now considered essential for safety.

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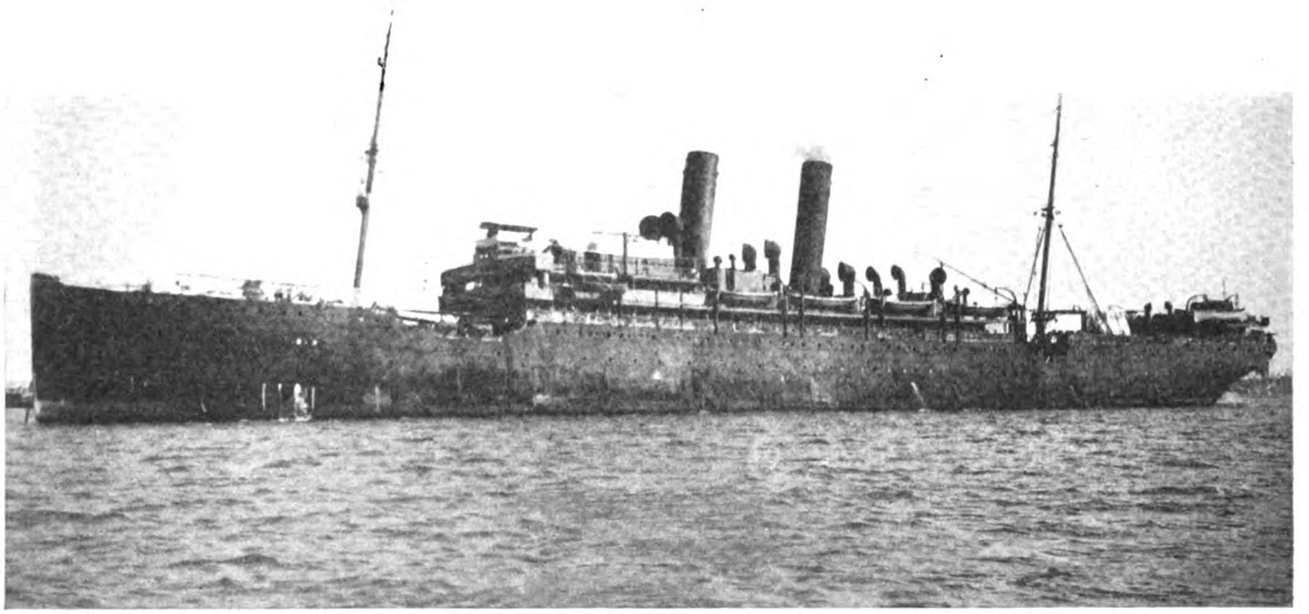
of New York, Boston and Chesapeake bay were the most completely wrecked, probably since they were closest to the headquarters of the Germans in charge of the vandalism. It is now believed this work was directed from the Hamburg-American Line offices in New York, with substantial connivance on the part of the German embassy at Washington.

Practically all the boats were damaged in the same manner, which would indicate that general instructions had been issued to all commanding officers by the same central authority. The parts damaged, as a rule, were those probably on hand as spares in the home ports of the vessels, or easily procurable from patterns, jigs, etc., already provided. Had not this country entered the war, the ships could have been again commissioned with a minimum of trouble by utilizing spare parts already provided. Smashing cylinders and valve chests was a favorite form of destruction. On the steamers RHEIN, NECKAR and BULGARIA turned over to the Norfolk navy yard for repairs, 17 of the 24 cylinders on the three ships were damaged, 15 so badly that they required welding.

The reader should not assume, however, that the German vandals confined themselves simply to obvious smashing and plain, unvarnished destruction. On many ships there was evidence of finesse and ingenuity in thinking up clever tricks. In some cases Prussian imagination fairly ran away with itself. On one ship the fire extinguishers were emptied and refilled with gasoline. In another case, electric light globes were ground to a powder which was put in the oil pumps, there to be distributed to the various bearings. Of course, to the nation guilty of the rape of Belgium, such tricks as these must have seemed mere child's play. Probably they represent simply the playful mischievousness of the ship's engineers after they were through with the heavy battering and smashing of their day's work.

Many other smart tricks were tried, but none succeeded in causing any damage. In some cases small pipes were uncoupled, plugged and screwed together again, to all external appearances in good order. Occasionally check valves were reversed—a simple operation effected quickly by uncoupling the valve and turning it over. On the giant VATERLAND, now the U. S. S. LEVIATHAN, a section of suction pipe to the fire and bilge pumps was found with holes bored in it. The holes had been plugged with putty and red lead and then covered so they would not be discovered. On the KAISER WILHELM II the intermediate piston rod on each engine was badly bent, but not so badly as to preclude its being straightened. On another vessel, the piston and connecting rods were sawed part way through and the saw cuts concealed. In still other cases, staybolts were sawed in two and replaced so they appeared to be in good order. Staybolts also were cut off just outside the plate, so the nuts held only by one thread. The broken ends of the bolts were screwed into the nuts to give the appearance of normal solidity.



GERMAN AUXILIARY CRUISER PRINCE EITEL FRIEDRICH SEIZED BY UNCLE SAM AND NOW IN THE U. S. NAVY

Steam valves were gagged and the indicators tampered with, so that in the case of some large valves, when the indicator showed "open", the valve was merely cracked. On a few ships dynamo connections were tampered with, gratings and runways were smashed and the engine-room telegraphs altered.

In the case of one ship the work of repair was completed and the vessel sent out for trial. At low speed all went well. Immediately after the engine was thrown into full speed, a tremendous knocking

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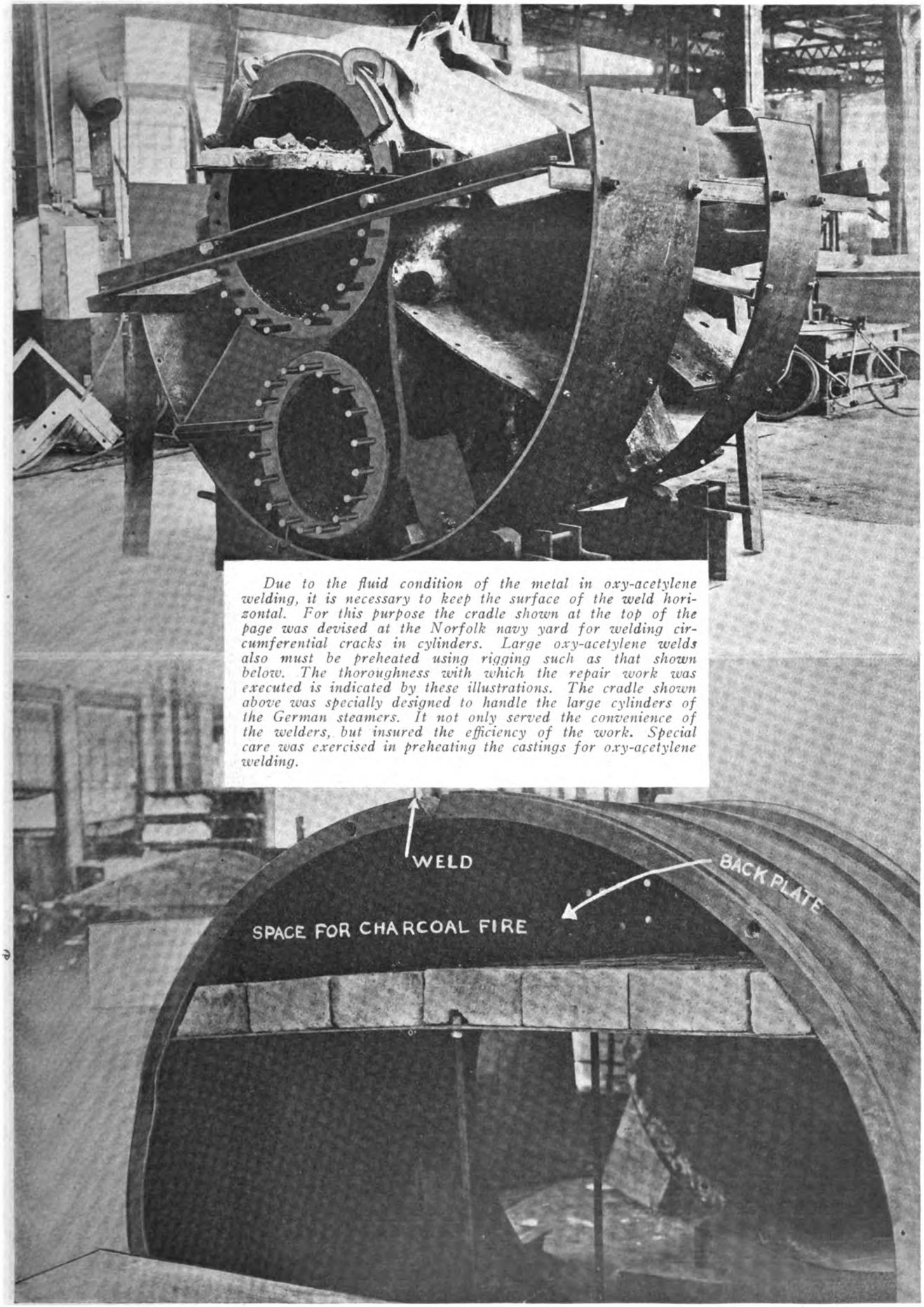

Due to the fluid condition of the metal in oxy-acetylene welding, it is necessary to keep the surface of the weld horizontal. For this purpose the cradle shown at the top of the page was devised at the Norfolk navy yard for welding circumferential cracks in cylinders. Large oxy-acetylene welds also must be preheated using rigging such as that shown below. The thoroughness with which the repair work was executed is indicated by these illustrations. The cradle shown above was specially designed to handle the large cylinders of the German steamers. It not only served the convenience of the welders, but insured the efficiency of the work. Special care was exercised in preheating the castings for oxy-acetylene welding.

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developed in one cylinder. The engine was shut down and the cylinder cover removed. A large machinist's hammer was discovered. It had been concealed in one of the steam ports and at low speed the steam velocity was insufficient to blow it out into the cylinder. At high speed it might easily have broken the cylinder head.

* * *

SUCH was the situation when American engineers and naval officers took up the problem of repairing the damage and placing the German ships once more in commission. Not only were cylinders and other vital parts smashed, but "strategy" such as that just outlined had been resorted to to delay and, if possible, prevent the use of the ships by American forces at any early date.

the German reckoned without his host. In this case all of the parts so carefully enumerated were repaired and no new castings were required.

In general, the problem of getting the German boats back into commission divided itself into two parts. First, it was necessary to ferret out and repair all the vandalism. At the same time each ship had to be completely refitted and overhauled to eradicate the effect of three years' idleness and neglect. Many of the boats were found to be in bad shape due simply to natural deterioration. Once more Prussian efficiency was found to have been asleep at the switch, and on most of the ships the work of refitting and overhauling actually required more effort than repairing the actual damage.

While the ships were being overhauled, their obvious

A Few of the Former German Liners With Their New American Names

German Name	American Name	German Name	American Name
Adamsturm	Actaeon	Hermes	Hermes
Allemannia	Owasco	Hohenfelds	Long Beach
Amerika	America	Holsatia	Tippecanoe
Andromeda	Bath	Indra	Tonawanda
Arnallas Vinnon	Chillicothe	Kaiser Wilhelm II	Agamemnon
Barbarossa	Mercury	Kiel	Camden
Bochum	Montpelier	Koenig Wilhelm II	Madawaska
Bohemia	Artemis	Koln	Amphion
Borneo	Nipsic	Kronprinz Wilhelm	Von Steuben
Breslau	Bridgeport	Kronprinzessen Cecilie	Mount Vernon
Carl Diederichsen	Raritan	Leibenfels	Houston
Clara Jebsen	Tioga	Locksun	Gulfport
Cincinnati	Covington	Neckar	Antigone
Coblenz	Sachem	Nicaria	Pensacola
Darvel	Wamsutta	Odenwald	Newport News
Dobek	Monongahela	O. J. D. Ahlers	Monticello
Elmshown	Casco	Pommern	Rappahannock
Elsass	Appelas	President	Kittery
Esslingen	Nyanza	Praesident Grant	President Grant
Farn Gerraux	Farn Gerraux	Praesident Lincoln	President Lincoln
Frieda Leonhart	Astoria	Prinzess Irene	Pocahontas
Friedrich der Grosse	Huron	Prinz Eitel Friedrich	De Kalb
Geier	Schurz	Rhein	Susquehanna
George Washington	George Washington	Rudolph Blumberg	Beaufort
Gouvernour Jaeschke	Watoga	Saxonia	Savannah
Grosser Kurfurst	Aeolus	Staatssekraetar Solf	Samoa
Grunewald	Gen. George W. Goethals	Vaterland	Leviathan
Hamburg	Powhatan	Vogenson	Quincy
Harburg	Pawnee	Willehad	Iroquois

On one German ship on the Pacific the work of destruction seemed so successful to the captain and chief engineer that they took the trouble to prepare a detailed list of the damage for future reference, carefully noting the parts that in their judgment had been wrecked beyond repair. A portion of this list, literally translated, follows:

1.—Starboard and port high-pressure cylinder with valve chest; upper exhaust outlet flange broken off. Cannot be repaired.

2.—Starboard and port second intermediate-pressure valve chest; steam inlet flange broken off. Cannot be repaired.

3.—First intermediate-pressure starboard; exhaust pipe of exhaust line to second intermediate-pressure, flange broken off. Cannot be repaired.

4.—Starboard and port low-pressure exhaust pipe damaged. Cannot be repaired.

But as we stated in the introduction to this article, engineering deficiencies, which had been revealed by surveys, were remedied. The boats were found to be far from the paragons of perfection that the continued advertising of German efficiency would lead one to believe. The great VATERLAND, for instance, although equipped with steam lines which in some cases extend over 300 feet, was almost totally unprovided with steam traps, and the few drains that were fitted were arranged to discharge into the bilge. The boilers of the VATERLAND were not fitted with internal feed pipes, and therefore primed very easily. Her turbines were faulty. The casings were subject to heat cracks, and on the last voyage across, the great vessel made the trip on three propellers at reduced speed. Plenty of other evidence was discovered on the interned vessels to prove that ordinary German engineering practice does not measure up to American standards.

In nearly every case the broken castings, including

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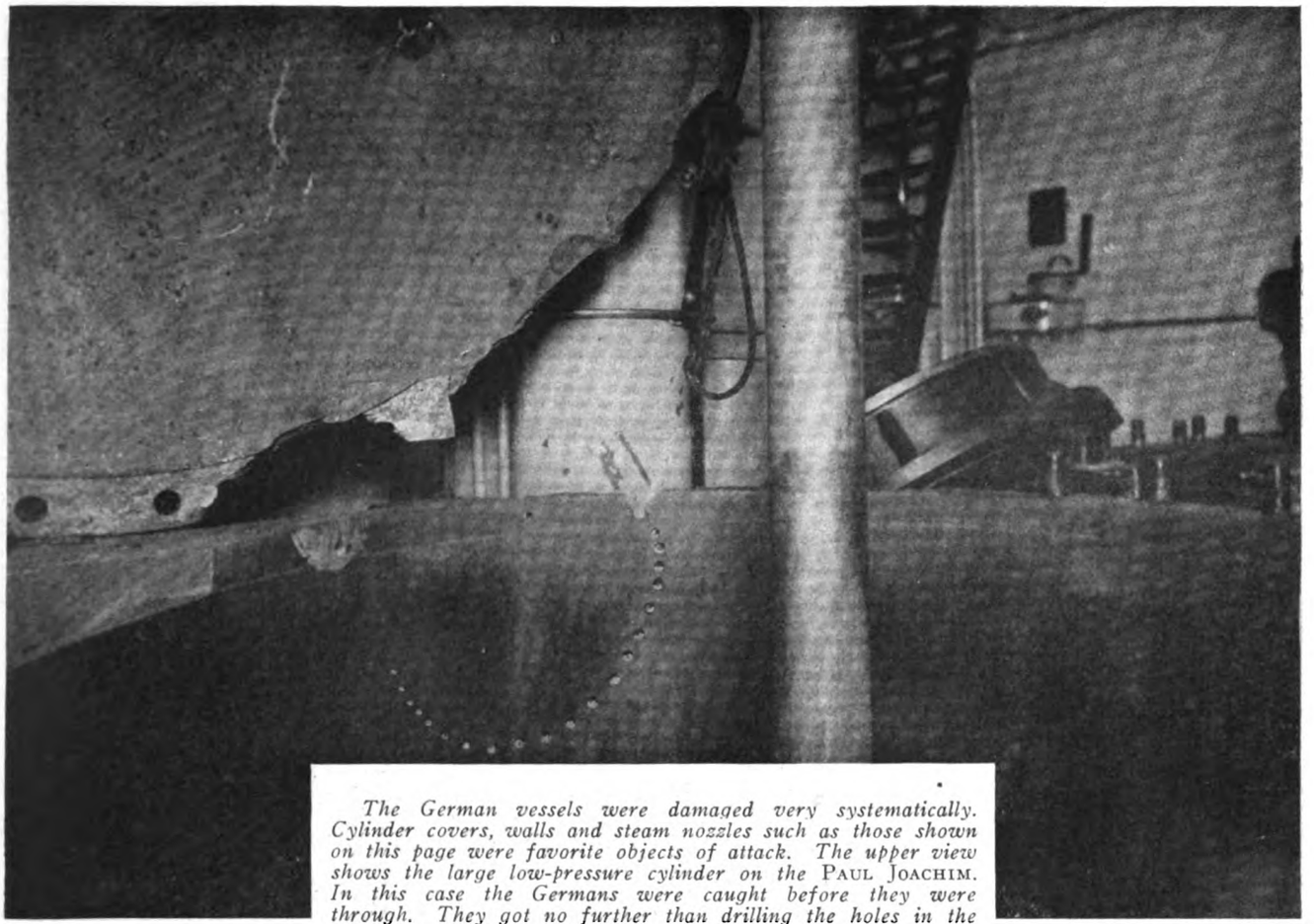

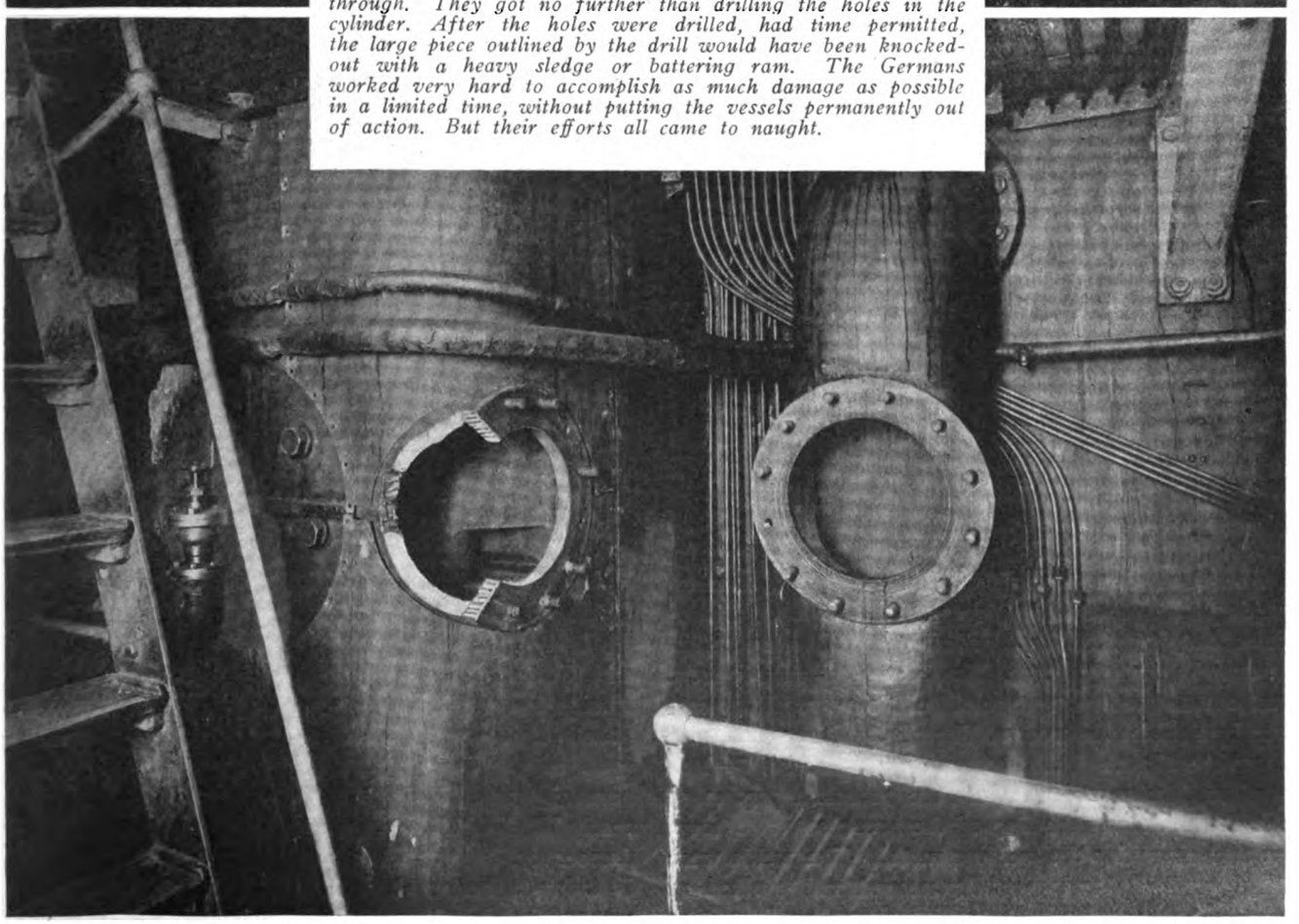

The German vessels were damaged very systematically. Cylinder covers, walls and steam nozzles such as those shown on this page were favorite objects of attack. The upper view shows the large low-pressure cylinder on the PAUL JOACHIM. *In this case the Germans were caught before they were through. They got no further than drilling the holes in the cylinder. After the holes were drilled, had time permitted, the large piece outlined by the drill would have been knocked-out with a heavy sledge or battering ram. The Germans worked very hard to accomplish as much damage as possible in a limited time, without putting the vessels permanently out of action. But their efforts all came to naught.*

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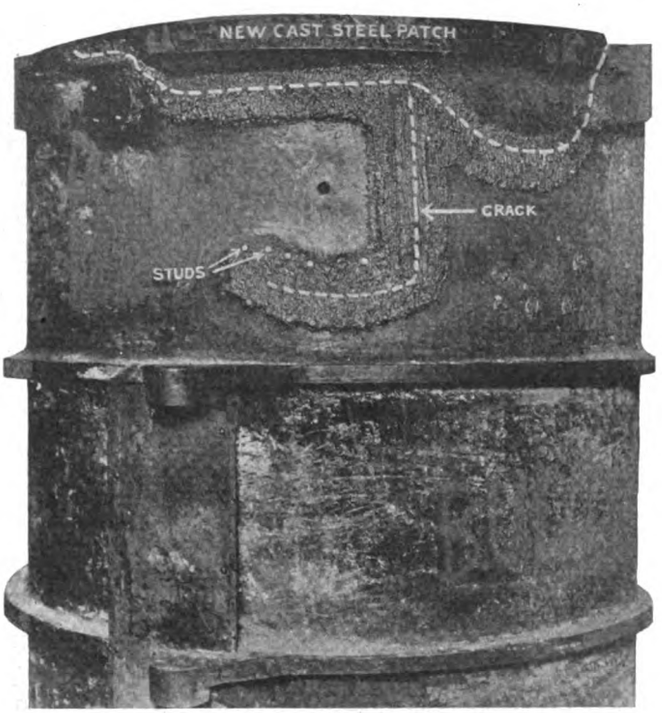
cylinders, cylinder liners, valve chests, pump casings, steam nozzles, etc., were repaired either by oxy-acetylene or electric welding. A few mechanical patches were applied. In some cases steam nozzles were renewed by screwing in new parts with a fine thread. Electric welding was used in a majority of the cases. All of the 31 vessels in New York harbor were repaired by this method. Great credit for the success of the work on these vessels should go to the welding crews and experts actually engaged in the work.

It was due to the fact that railroad experience in welding broken parts was drawn upon freely that the work was executed with such effectiveness and dispatch. To the engineer familiar with modern welding practice in railroad and industrial establishments, the work on the German liners presents no novel features. No new principles were applied or untried methods attempted. In fact, the unusual success attending the entire effort rests largely on the fact that only time tested methods were applied.

The instructions of the navy department were broad; thoroughness, and satisfactory results were the principal factors insisted upon. The orders of the general officer in charge of the work contained the following injunction: "Nothing should be taken for granted. Examine every piece of machinery and piping carefully. Work only by the process of elimination, in order that no vandalism may be overlooked."



This is a particularly difficult electric weld. The method of anchoring the weld to studs and the cord-like structure are clearly visible. This weld was tested four times before passed as tight. In every case the leak was between the welded metal and the cast-iron cylinder wall. No leaks showed where the welded metal joined the cast-steel patch.

In preparing the electric welds, standard railroad practice was followed. Since the broken parts had been thrown overboard, it was first necessary to make castings to replace these pieces. This required a careful survey of each boat, followed by the preparation of drawings and patterns. The new pieces usually were cast out of steel, because steel welds most readily to cast iron by the electric process. The edges of the welds were chamfered in the usual manner. In most cases 7/8-inch steel studs were screwed into the unbroken portion of the casting, along the line of the break so as to form an anchorage for the welding metal. The welds were filled gradually and carefully peened and caulked as the work proceeded. Air caulking was an important part of the process as it served not only to densify the metal, but to close up porous spots and locate brittle sections, which were always cut out and refilled.

As a result of the capable manner in which the welding problems on these boats were handled, some startling economies of time and money were realized. It was estimated that new cylinder castings for the GEORGE WASHINGTON would cost $65,000. The broken parts were actually welded electrically for $15,000. What is even more important, six months time was saved. To replace two broken cylinders on another boat it was estimated an expenditure of $32,000 would be required, together with 10 to 12 months time. The damage was repaired by electric welding in 52 hours at a cost of $2600.

Equally startling and satisfactory results were secured from the oxy-acetylene process. Some details of this phase of the work were included in a paper on oxy-acetylene welding presented at the Boston meeting of the American Foundrymen's association by Stuart Plumley and published in *The Iron Trade Review*, Nov. 22, 1917. Most of the oxy-acetylene welding was performed at the Norfolk navy yard. The cylinders were removed from the boats and taken to the shops where the work could proceed expeditiously. The usual preheating methods were followed. All of the welds were tight and no trouble has developed. Steel anchorage studs, such as were employed for the electrically welded cylinders, were not utilized. Also the broken parts were replaced by cast-iron instead of steel pieces, since by the oxy-acetylene process it is practicable to weld two cast-iron surfaces, using a cast-iron filling rod.

Such are the outlines of the great contest between Prussian vandalism and American constructive genius. The Germans played, and lost. Today our merchant marine and transport service is just 109 ships to the good. These vessels have been reclaimed from the jaws of the Prussian monster and set to work for humanity and freedom. Their aggregate tonnage is nearly 700,000. They are serving the nation in its war for democracy. Best of all, virtually every one of these boats is today a better all around steamship that it ever was under the German flag. Such is true efficiency.

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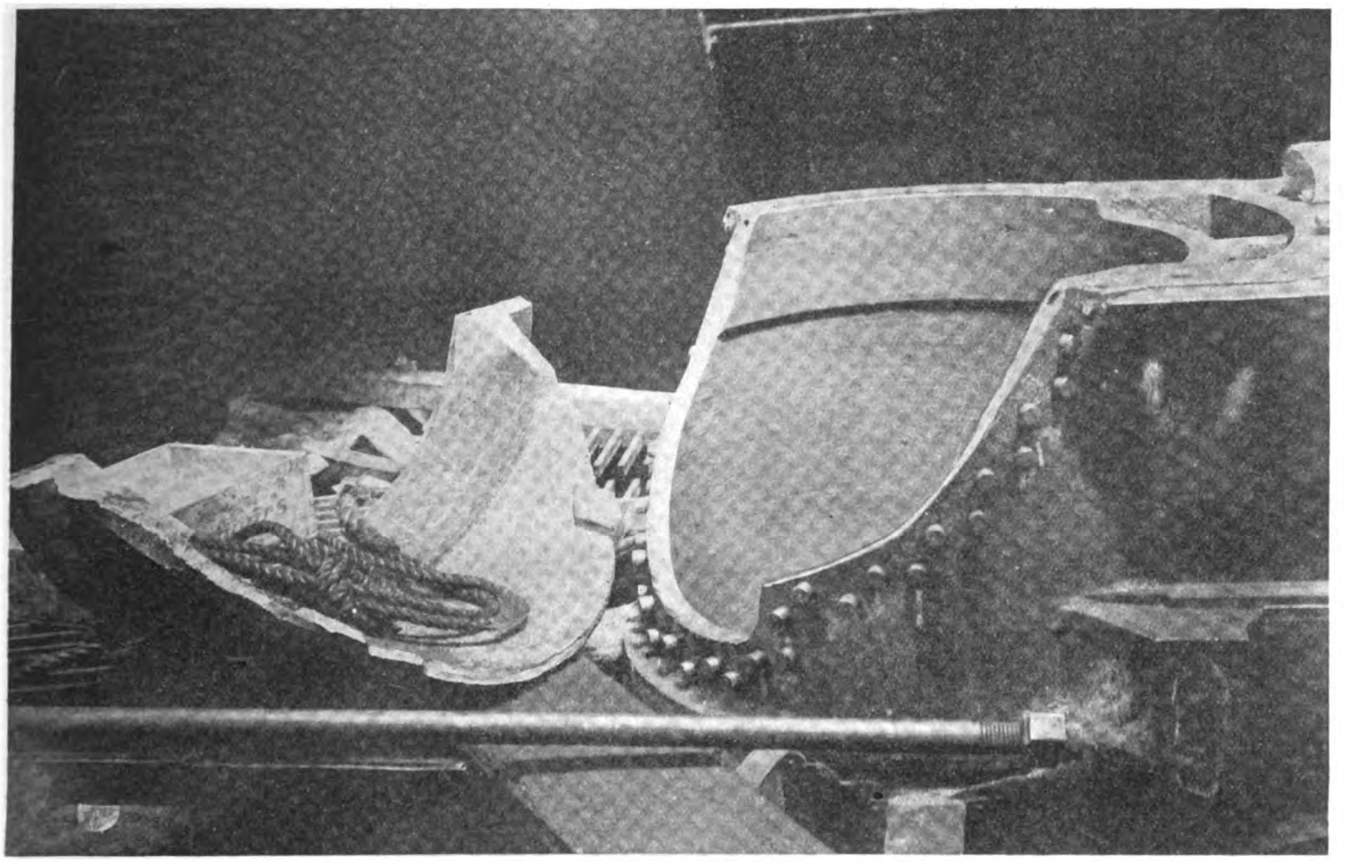
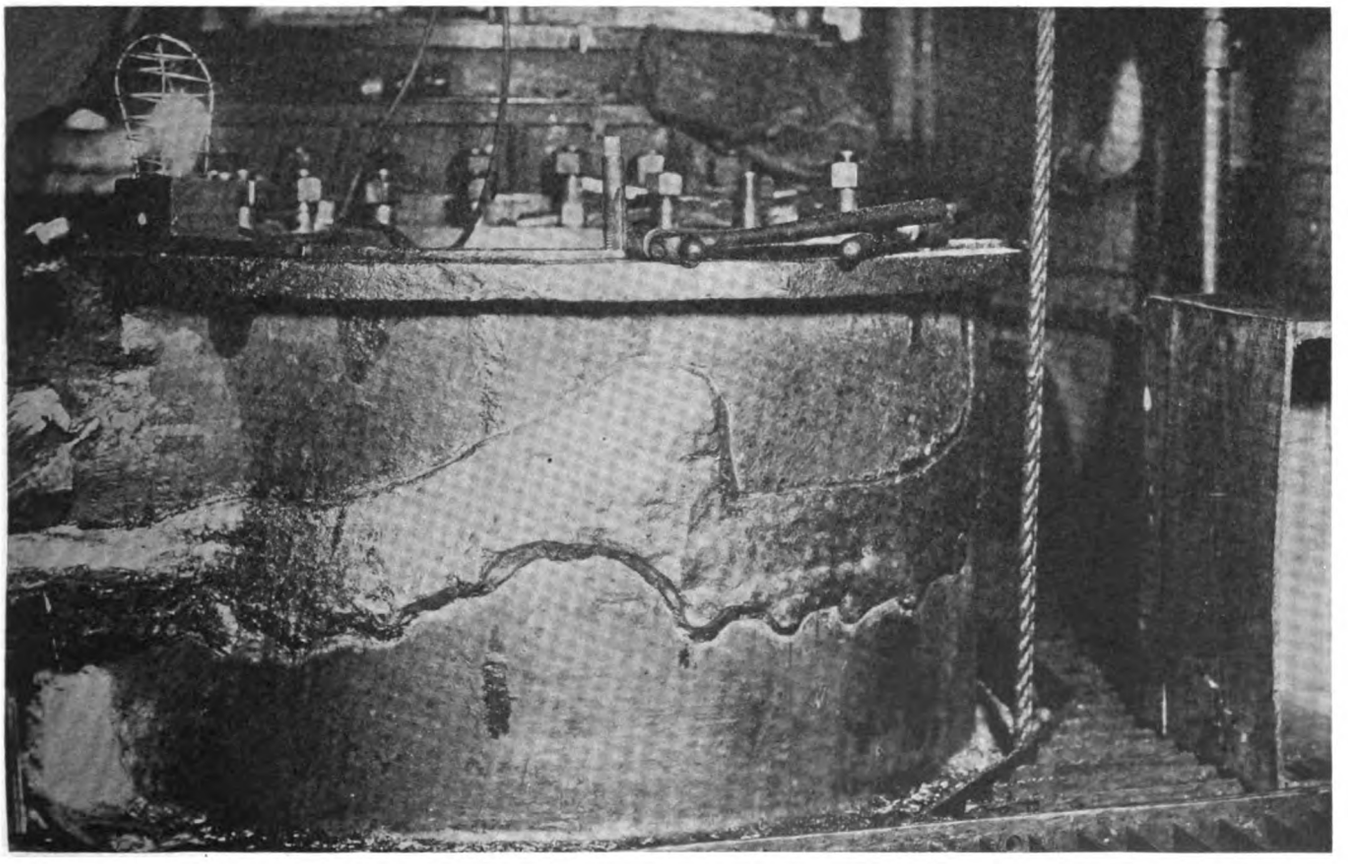


AN UGLY BREAK IN THE HIGH-PRESSURE VALVE CHEST OF THE PRINCESS IRENE

This illustration, and the one below, show in an unusually graphic manner the difficulties the welding engineers had to contend with. Their success was due to their skill and persistence. No chances were taken. Where it was necessary to refinish cylinders on the inside they were either rebored in the shop or ground with a special portable rig.



A COMPLETED ELECTRIC WELD ON THE FIRST INTERMEDIATE CYLINDER OF THE IRENE

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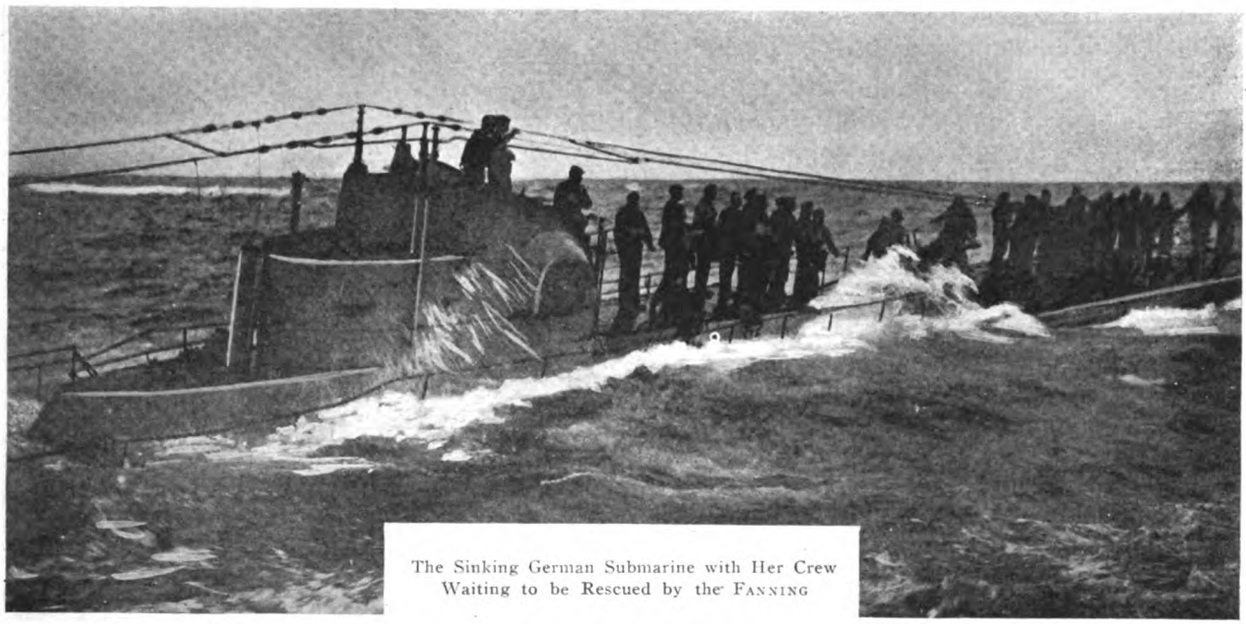

The Sinking German Submarine with Her Crew Waiting to be Rescued by the FANNING

U. S. Sailors Risk Life to Save Germans

WHEN a convoy of merchantmen is attacked in the North sea by vessels of the German navy, those aboard know just what to look forward to. A woman alone on a life raft expects to be shot. Noncombatants as well as members of the naval forces of the allies have learned how little the Prussians care for the chivalry of the high seas.

When the officers and crew of a German submarine are forced to surrender to an American warship they, too, know what to expect. Although they are members of the kaiser's fighting forces and are not noncombatants they know that as soon as the brief skirmish is over the Yankees will risk death itself to rescue their opponents of a few moments earlier.

The contrast between the tactics adopted by the United States and German navies has been forcibly illustrated within the last few weeks. A convoy of merchantmen was scattered by German destroyers. German efficiency did not permit any rescue work to interfere with the main business of sinking unarmed ships. Almost at the same time, two American sailors plunged from the deck of a destroyer to save the life of a German seaman whose submarine a few minutes before had attempted to torpedo their own destroyer.

The destroyer, the FANNING, was commanded by Lieut. A. S. Carpender, Lieut. G. H. Fort being the executive officer. About 4:10 p. m., Nov. 24, the lookout on the FANNING, Coxswain David D. Loomis, sighted a periscope about a foot above the water some distance off the port bow. After a few seconds the periscope disappeared. The FANNING immediately headed for the spot and three minutes after the periscope had been sighted, dropped a depth charge.

A sister destroyer, the NICHOLSON, speeded to the position of the submarine, which appeared to be headed toward a convoyed merchant vessel, and dropped another depth charge. At that moment the conning tower of the submarine came to the surface. Directly, the NICHOLSON fired three shots from her stern gun. The bow of the submarine came up rapidly. The boat was down by the stern but righted herself and increased her speed. The FANNING had turned and now headed for the submarine, firing from her bow gun. After the third shot, the crew of the submarine came on deck and held up their hands. The submarine surrendered at 4:28 p. m., 18 minutes after she was first sighted.

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VIEW FROM DECK OF FANNING

While both vessels kept their batteries trained on the submarine, the FANNING approached to pick up the prisoners. In a few minutes the submarine sank and the crew took to the water and swam toward the FANNING. Although the crew wore life preservers, many of them were exhausted when they reached the side of the destroyer. Ten of the crew were so weak that they had to be hauled aboard by means of lines passed under their armpits. One man was so exhausted that he was unable to retain a hold on the line. Noticing his danger, Mate Elzer Harwell and Coxswain Francis G. Conner leaped into the water and rescued the German.

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THE HYMN OF WORK

Four Original Drawings of America's Shipbuilding and Naval Activities

By

JOSEPH PENNELL

With Captions by the Author

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Unloading Ore Boats

When the great ore boats arrive "somewhere" they draw up at a crane-covered dock and almost as fast as they are loaded they are emptied—and the ore is in the furnace —then they steam away for more

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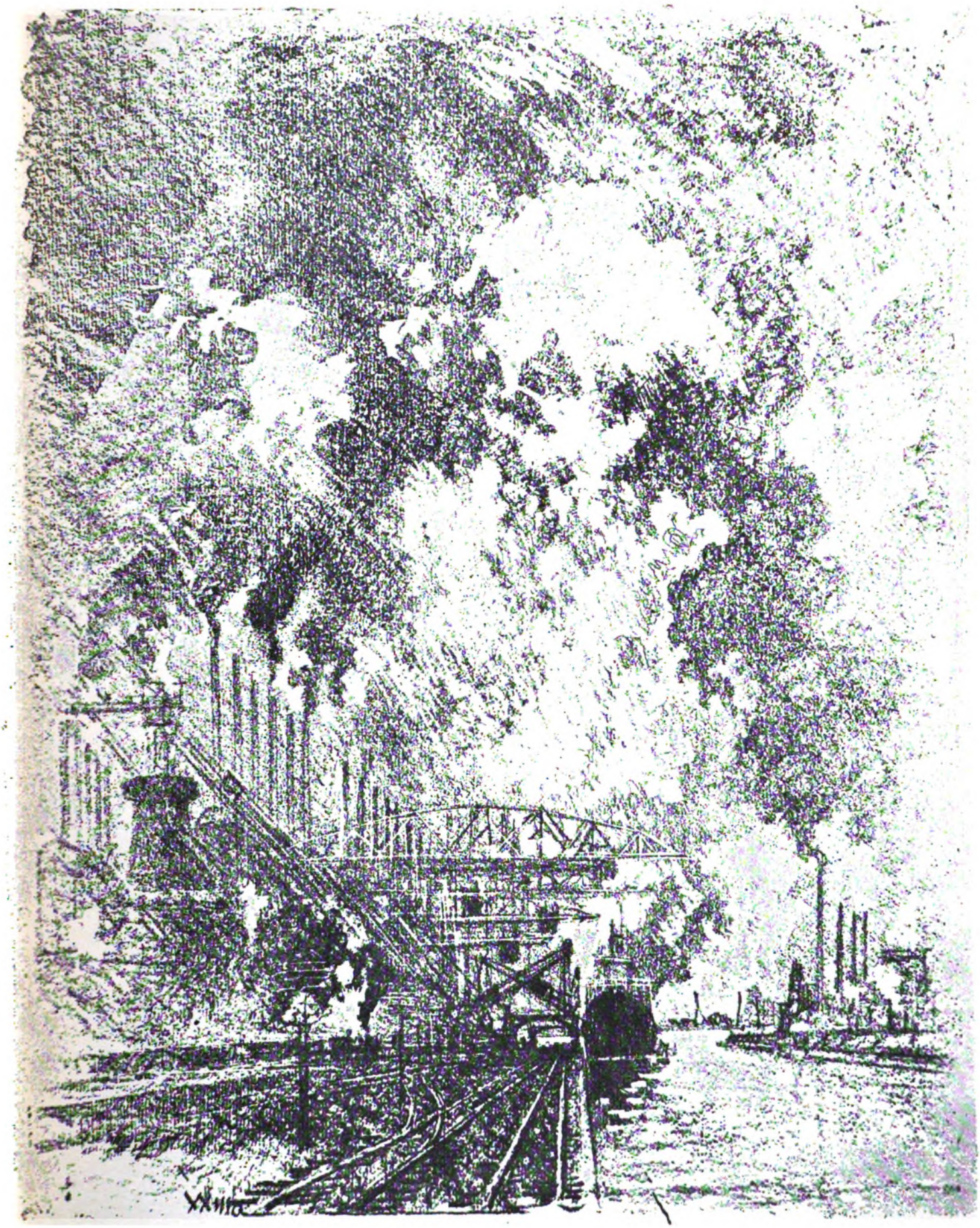

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The Riveters

What perpendicular cathedral is as full of mystery as this shop? I know of none and I know most of them; and when the fires glow on the work altar and the great jaws pierce and rivet the boiler plates, one hears the Hymn of Work

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Making Propeller Blades

Blue in the shadows, and such blue!—gold in the light, and such gold!—were those blades—in the great shop—and as I worked, the engines steamed in and a propeller went out to fit in the ship standing in the dock just outside

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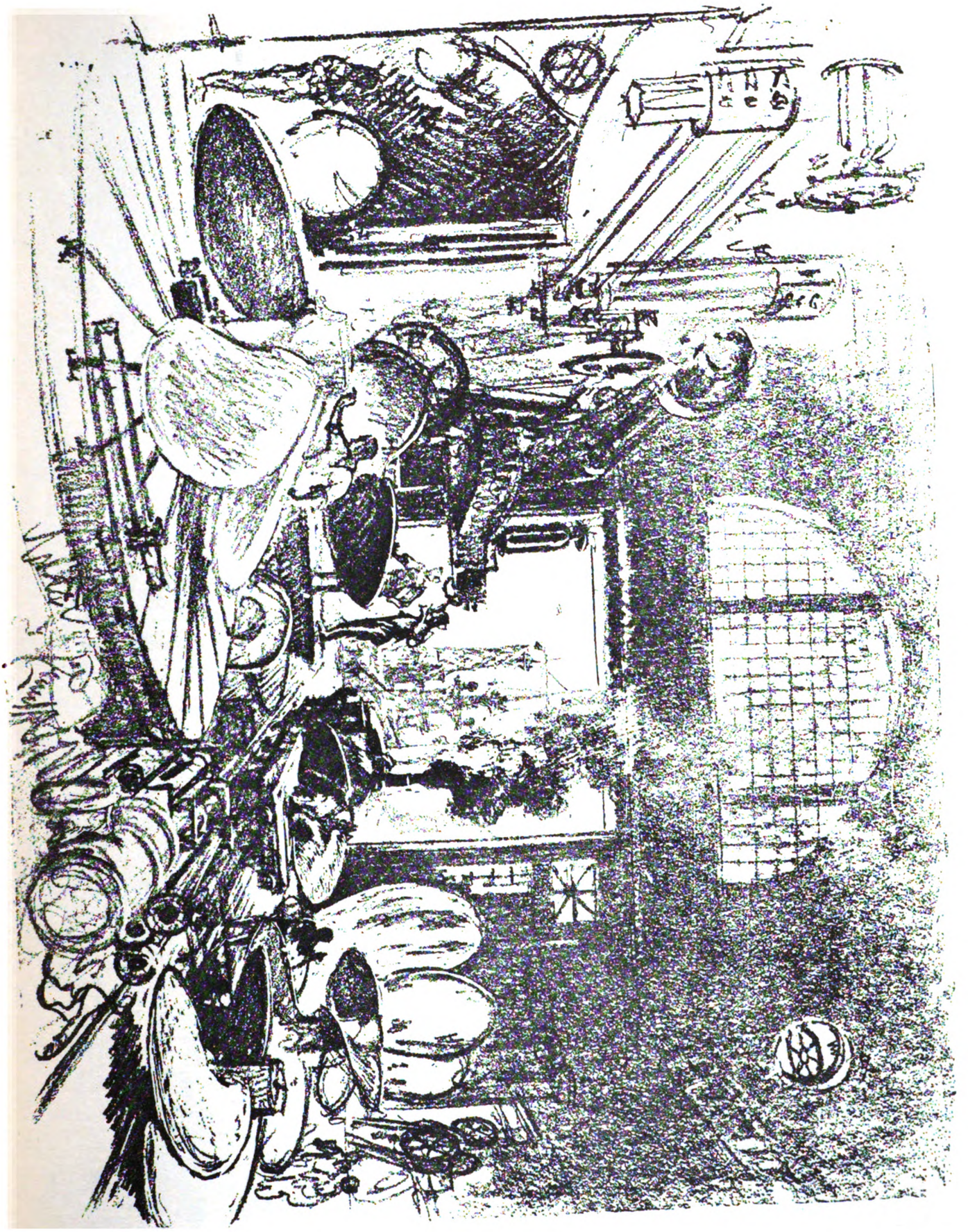

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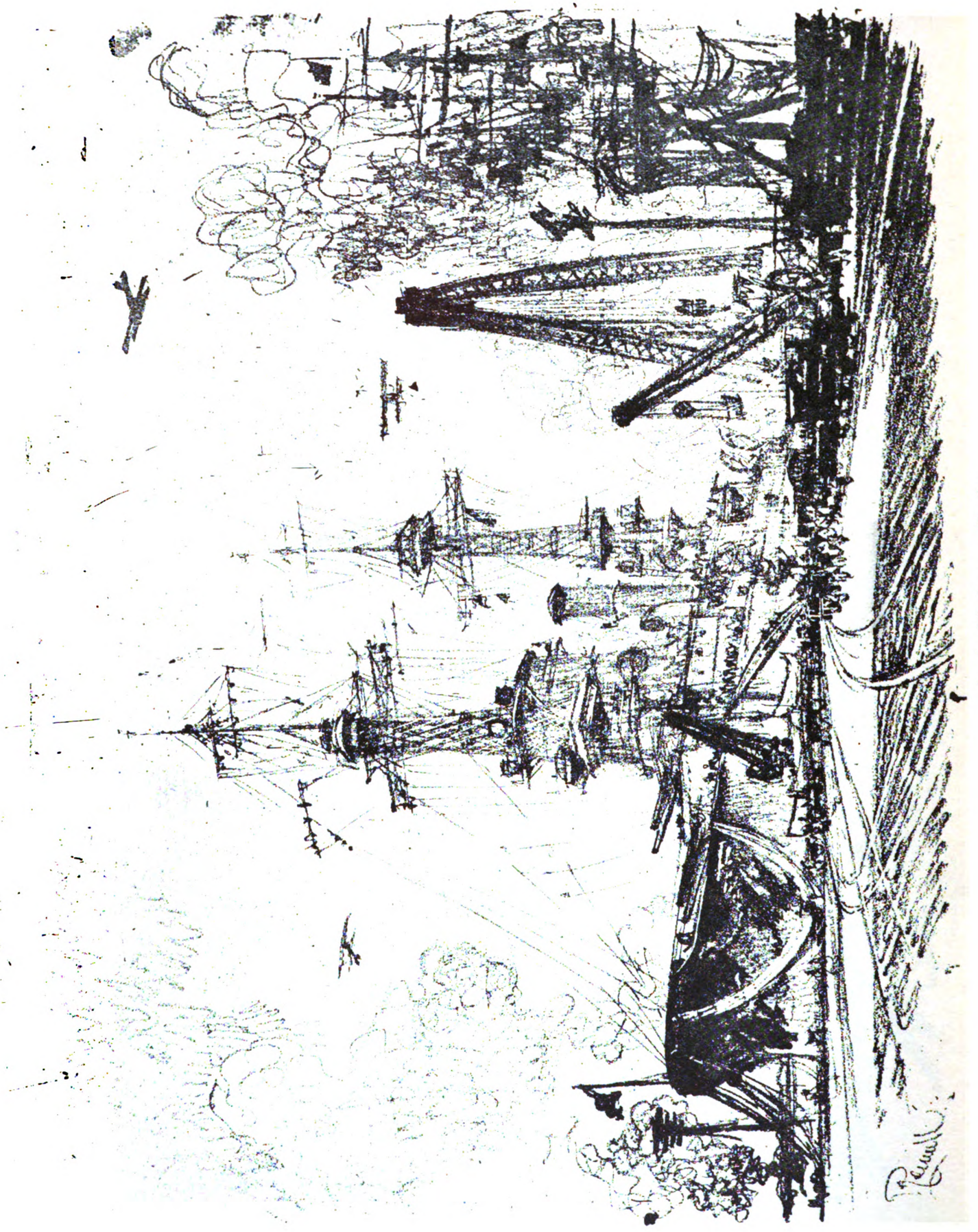

At the Fitting-out Docks

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Proposed Barge for New Waterway

Type and Size of Cargo Carrier Advocated for Use on the New York State Barge Canal — Analysis of Traffic Conditions on New Freight Route

By Henry J. Gielow

IN 1874 congress made an appropriation for surveys and reports of transportation routes from the middle west to the Atlantic seaboard. These surveys and reports were made on three routes: the Mississippi river to the Gulf of Mexico; the chain of Great Lakes, through the Erie canal, down the Hudson river to the Atlantic; the Mississippi river up to the Tennessee river to Guntersville, Ala., from where it was proposed to carry freight over a double track railroad line to Brunswick, Ga., a distance of 412 miles. No further action was taken by the government in connection with these surveys except to improve the Mississippi river route. The state of New York continued to operate the Erie canal, and later made provisions for improving and enlarging it. This barge canal at the present time is practically completed. The Oswego route is almost ready for service while the Buffalo route will be completed by July 1.

Owing to the congested condition of railroad transportation due largely to war conditions and other causes, the problem of handling freight by water routes becomes of more than ordinary importance. Steps have already been taken for building a number of barges for increasing the freight carrying capacity on the Mississippi river. While plans to handle freight on the New York state barge canal have been considered no vessels for this service have yet been launched.

A brief consideration of water transportation along the chain of Great Lakes and through the New York state barge canal to the Atlantic seaboard involves a study of the following factors:

1.—Water transportation on the Great Lakes, and type of vessel in use.
2.—Transportation through the New York state barge canal, and type of vessel to be used.
3.—Water transportation along the Hudson river from Albany to New York.
4.—Type of vessel used for distributing freight and cargoes in New York harbor.
5.—Barge transportation along the Atlantic coast, and type of vessel in use.

Water transportation on the Great Lakes has been worked up to a high degree of perfection, special attention having been paid to quick handling of freight, both in bulk and in package. Many wharves and docks are equipped with special machinery and devices for cargo handling purposes. The vessels themselves are of different sizes, reaching a maximum of about 600 feet in length. Many are equipped with their own propelling power, but a large fleet of

HENRY J. GIELOW

barges, which are towed by powerful tugs or steamers, is in use.

As the New York state barge canal has not yet been opened for active service, no distinct type of vessel has been developed for this waterway. Up to this time, this traffic has been handled through the Erie canal, the locks for which can only accommodate boats of approximately 98 feet overall length, about 16½ feet beam, with a draught of just under 6 feet when fully loaded. The method of propulsion is primarily by means of a tow line drawn by a horse or mule along the conventional tow path. Some craft are equipped with their own motive power. A large fleet of these boats is now in existence, and will be a valuable adjunct for some years to come.

A new type, however, will have to be developed to meet the conditions set by the dimensions of the barge canal. The locks of this canal are 310 feet in length between gates, 45 feet wide in the clear, and with 12 feet of water over the miter sills. Generally 12 feet is the ruling depth of the water throughout this canal.

Transportation on the Hudson river, excepting a local freight and passenger service, is practically a continuation of the canal service, extending from Albany to New York. The draught of water in the upper reaches of the Hudson river immediately below Albany is 12 feet at mean low water, thus being identical with the draught of the barge canal. Between Albany and Troy the depth is a full 10 feet, but as there is a mean rise and fall of tide of over 2 feet, 12 feet of depth is available at high water.

The type of vessel used for distributing local freight in the vicinity of New York City is a craft from 110 feet to 125 feet overall length, with a beam ranging from 22 feet to 28 feet, but with no especial limitation on draught. The latter ranges from 5 to 10 feet.

The type of barge generally in use for transportation along the Atlantic seaboard from Norfolk, Va., to Boston, and even to the coast of Maine, is a vessel about 200 feet in length, 36 to 38 feet beam, and 22 to 24 feet depth of hold. With the great draught permissible, together with the corresponding greater depth of hold and cargo capacity, the majority of these vessels are built of wood, and have an approximate carrying capacity of from 1600 to 2000 tons net. These vessels have no motive power of their own, but are usually towed in groups of three by large seagoing tugs which are capable of maintaining a speed of 6 to 8 knots under ordinary weather conditions.

In all shipment of freight it is obvious that rehandling or reshipping is unprofitable. In other words, it is desirable to carry freight from the shipping point to its destination without any work other than the labor of transportation. Any rehandling involves a loss of time and labor, both of which add to the total cost.

As the speed through the New York state barge canal is limited to 6 miles per hour, and in deeply loaded vessels will be reduced to about 4

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miles per hour, it will take comparatively little power to tow a barge or several of them through the canal. On the other hand, when the waters of the Great Lakes are reached, and the speed can be advantageously increased to fully double this, the horsepower applied will be from eight to 10 times as great, so that it will be a difficult problem to devise machinery to work economically in going through the barge canal. Therefore, it does not seem practicable or feasible to have self-propelling boats. The successful way of solving the propelling problem will be to have comparatively small tow boats for service through the canals and large powered boats for service on the Great Lakes and probably up and down the Hudson river, thus eliminating the propelling factor from the barge problem.

Barges for Harbor Service

The size of the effective freight distributors along the New York water front is fixed by experience between 110 to 125 feet in overall length. It is apparent that this vessel would be entirely too small for the heavy weather conditions encountered on the lakes. In fact, with the great number of present canal boats in existence, this feature of the freight problem could be well taken care of by the existing fleet.

Experience has taught that in all transportation problems size has been an important and economical factor, modified only by local conditions as to handiness and convenience of certain type of vessels for the work in certain localities. Keeping this in mind, the problem resolves itself into the question of how large a vessel can be built to go through the barge canal, at the same time being a serviceable and thoroughly substantial seaworthy vessel for lake transportation, as well as for Atlantic coastwise service.

The first thought would be to make a vessel as large as the locks of the barge canal can handle, giving a vessel about 300 feet long and about 42 feet beam. A consideration, however, of the canal details develops the fact that the height of bridges above the water surface is 15 feet, and the loaded draught of the vessel being limited to about 9 feet 6 inches for successful navigation of the canal, the distance from the under side of the keel to the top of the highest fixed superstructure is limited to about 22 feet 6 inches, making the molded depth of the hold about 20 feet.

There are certain well established engineering laws that determine the length of a structure in proportion to its depth, beyond which it is poor practice to go. If this length is exceeded, it involves a very rapid increase in weight of material required to give the necessary strength and stiffness. To quote a simple engineering axiom, "the strength of a girder increases with the square of its depth," so inversely the additional material required on a fixed depth increases as the square of the length. In other words, if a structure on a fixed depth and fixed length is correctly proportioned, then an increase of 10 per cent in length, without a change in depth, will increase the materials in the top and bottom members of the construction 20 per cent. As a vessel or barge may be considered as a form of girder, the depth of 20 feet fixes the length of a vessel suitable for the canal service as well as the length of a thoroughly seaworthy craft for use on the Great Lakes or Atlantic coastwise service, at 200 feet overall for steel construction, and something less if wood were employed.

The depth being fixed by height of bridges and draught permissible on the barge canal, the remaining factor is that of beam. The canal permits a width of about 42 feet, but beam must to a certain extent be governed by a fixed depth. Sound engineering shows that the maximum permissible on a 20 feet depth of hold would be normal at 36 feet, but a beam of 38 feet could be used. With the fixed overhead bridges the sheer of these barges will, of course, be straight from end to end.

Type of Barge Recommended

In accordance with the foregoing, the type of barge recommended will be of the following dimensions: Length overall, 200 feet; beam, 38 feet; depth of hold, 20 feet. It is to be constructed of steel with a double bottom, which will be used for ballast tanks and also with tanks in the wings so that when this type of barge is absolutely light, it can be taken through the canal by simply filling the tanks with water, thus bringing her down to a line of flotation that will readily permit passage under the fixed bridges. The water supply will be under perfect control, and will be operated by a powerful bilge pump. The crew's quarters will be aft of the pilot house.

The pilot house will be fitted with a steering gear inside, for canal service; but for service on the Great Lakes, where a better lookout is desirable, and where there will be no overhead bridges, a collapsible rail and steering gear will be fitted on top of the pilot house, arranged so that it can be set up or dismantled in less than one-half hour. In the forward part of this barge a vertical steam boiler would be installed for supplying steam for the steam steering gear, steam towing engine, bilge and ballast pump, and necessary winches for handling warps and fast lines rapidly. The funnel, of course, would be made telescopic or hinged, so that it could pass under the bridges.

Use for Barges in Winter Time

In view of the fact that the transportation through the canal will be available only for about seven warm weather months, it would leave these barges idle for the rest of the year. This has been taken into consideration, and these barges could be made available, and used for Atlantic coastwise transportation during the winter months. With the limited transportation facilities now available on the Atlantic seaboard these barges should have no difficulty in getting all the freight they could carry. To make them habitable and thoroughly serviceable for this purpose, provision would be made to install three masts, fitted with staysails, to steady them in a seaway. A steel pilot house would be fitted over the permanent one, and a steel deck, or turtle back, would be bolted on forward and thoroughly braced and stanchioned inside. This could be done at comparatively small cost, and would make these barges suitable for the severest winter weather.

There seems to be a great deal of confusion and misunderstanding with reference to the term tonnage or tons. For instance, in the pamphlet issued on Oct. 1, 1917, by Gen. W. W. Wotherspoon, superintendent of public works, entitled "The Canal System of New York State", the second paragraph on page 13 reads as follows:

"A barge 150 feet long; 21 feet wide; draught, 8 feet, carrying capacity say 600 tons. Such craft could be operated in fleets of four; and if one of the four were equipped with power, the fleet could pass through a lock at one time. In navigating the canal the power boat would push one barge and tow two. The freight-carrying capacity of the power boat would not be greatly less than that of the barges."

As may be noted, the statement is made there that the barge in question has a carrying capacity of 600 tons, and the average reader would doubtless assume that 600 tons meant 1,200,000 pounds net, or 1,344,000 pounds gross weight. This, however, is entirely erroneous as the tonnage in this case refers to the number of cubic feet hold space, based on 40 cubic feet of space per

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ton, which means 24,000 cubic feet of hold space, available for the storage of freight. As a matter of fact, the displacement of this barge on a draught of 8 feet would be in round numbers 525 tons. The probable weight of the hull would be about 175 tons, leaving an available buoyancy of 350 gross tons deadweight capacity for carrying cargo. In other words, a cargo weighing 350 tons would load the barge down to the 8-foot draught line. Attention is especially invited to the distinction between tonnage measurement and deadweight tonnage. Measurement represents 40 cubic feet of hold space per ton, whereas a ton by deadweight means one gross ton or 2240 pounds in actual weight.

The carrying capacity of the proposed barge is 970 gross tons deadweight on a draught of 9 feet 6 inches, about the limit of draught permissible in the New York state barge canal. The hold capacity is 56,576 cubic feet, and when fully loaded will have a capacity of 45,460 bushels of any variety of grain. If loaded with oats the weight would be equivalent to 650 gross tons; if with wheat it would amount to 1218 gross tons, and the draught would be just 11 feet. The 9-foot 6-inch draught would be obtained on a load of 36,213 bushels of wheat, or 38,800 bushels of corn. For work on the Great Lakes or salt water service the barge could be loaded to a draught of 13 feet, and on this draught would have a carrying capacity of 1600 tons deadweight. If loaded with bituminous coal to the full capacity of the hold the weight would be 1380 tons, showing that the vessel would be loaded to a draught of 11 feet 10 inches. On a draught of 13 feet the barge will have ample freeboard and buoyancy to withstand any condition of wind or sea, either on the Great Lakes or the Atlantic ocean, and her scantlings are to be of sufficient size and strength to withstand the exigencies of this service.

An alternate design of a barge constructed of wood, in accordance with dimensions best suited for the service, and of maximum dimensions that good construction would permit without excessive sizes of scantling, should have the following principal dimensions: Length over all, 175 feet; beam to outside of planking, 36 feet 2 inches; depth, molded, 19 feet 6 inches. The construction would be of the regular, standard type, and attention is especially invited to the form of the cargo space, which will permit unloading by means of a clam shell bucket. At the same time this construction will give an excellent method of bracing the sides of the vessel, and serving the purpose of knees, which at the present time are expensive and hard to get. The equipment of this wooden barge is to be substantially the same as described for the steel barge.

The cargo carrying capacity of the proposed wooden barge is 685 gross tons on a draught of 9 feet 6 inches, about the present draught limit for effective operation through the New York state barge canal, and when fully loaded to a draught of 13 feet, for service on the Great Lakes or along the Atlantic seaboard the cargo carrying capacity will be 1205 gross tons. The capacity of the hold or cargo space when fully loaded will be 40,560 cubic feet, or equal to 32,591 bushels of any variety of grain. If fully loaded with bituminous coal this would be equal to 941 gross tons, and would represent a draught of 11 feet 4 inches; if loaded with oats the deadweight would be 465 tons, and the draught 8 feet; if loaded with wheat the weight would be 873 tons, and the draught 10 feet 3 inches. It may be noted that the actual carrying capacity on a 9-foot 6-inch draught is 685 tons, whereas the weight of wheat that the cargo space will hold is 873 tons, or 188 tons in excess of the buoyancy, while with oats the buoyancy is 220 tons in excess of the load. This is probably as good an adjustment as can be made with present draught limit for the canal.

To allow the barge to pass through the canal and clear the bridges successfully, when absolutely light, would require a draught of 5 feet 6 inches forward and 6 feet 6 inches aft, but as the weight of the hull is 60 tons less than the displacement, at this line of flotation, it will be necessary to provide cylindrical steel tanks which, together with the water, will make up this 60 tons, and which will have to be located in the double bottom aft of amidships, so as to produce the proper trim. It is believed, however, that these tanks may be dispensed with, for the reason that the only time that this additional immersion will be necessary is when passing under the bridges, which will, therefore, be in still water. It appears to the writer that the same result can be accomplished by letting about a foot of water into the bilges in the after compartment, and

(*Concluded on page* 85)

Suggested Types of Barges and Tugs for New York Barge Canal

IN the accompanying article Mr. Gielow has analyzed carefully the problems involved in designing suitable types of vessels for handling the enormous amounts of freight which the New York state barge canal is expected to receive from the Great Lakes. Serious congestion will develop at Buffalo, the western terminus of canal traffic, and the eastern terminus of lake traffic, unless adequate provision is made for handling both east and westbound freight without delay. In fact, the successful use of the barge canal depends largely upon the development of barges designed to meet the peculiar conditions involved in handling traffic through the canal. The author describes in detail the types of barges and tugs which he considers best adapted for this trade. He analyzes carefully the problems involved. For instance, careful consideration is given to such different features as navigation on the Great Lakes, through the barge canal, on the Hudson river, in New York harbor, and along the Atlantic seaboard. He presents an exhaustive study of the available draughts, the limiting height as determined by bridges over the canal, permissible speeds, and uses for the canal equipment during the closed winter season.

Mr. Gielow is senior member in the firm of Gielow & Orr, naval architects and engineers. He is well known as the designer of the nonmagnetic survey ship CARNEGIE *for the coast and geodetic survey. He has designed a great many successful commercial boats, but in recent years he has devoted his efforts almost exclusively to the designing of large steam and gasoline pleasure yachts.*

The need for prompt and accurate solution of the important problems faced in securing the fullest use of the New York state barge canal becomes evident when it is realized that most of the canal has been completed and navigation throughout its entire length will be possible within a few months.

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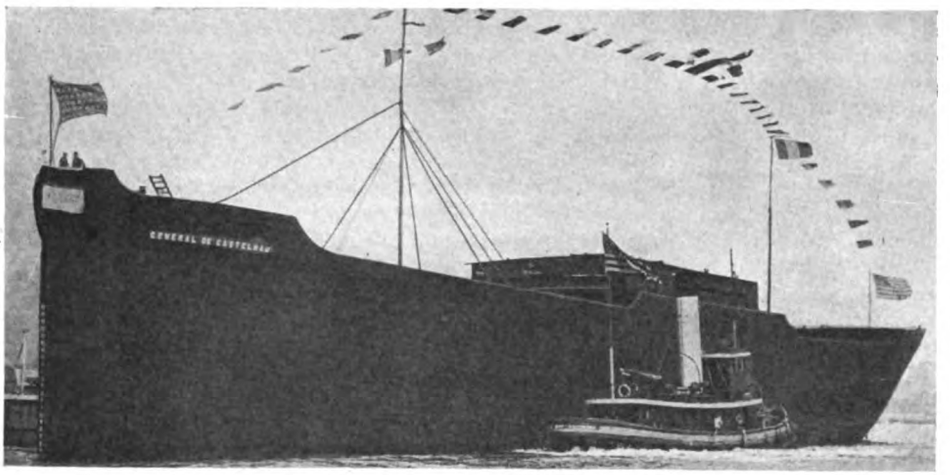
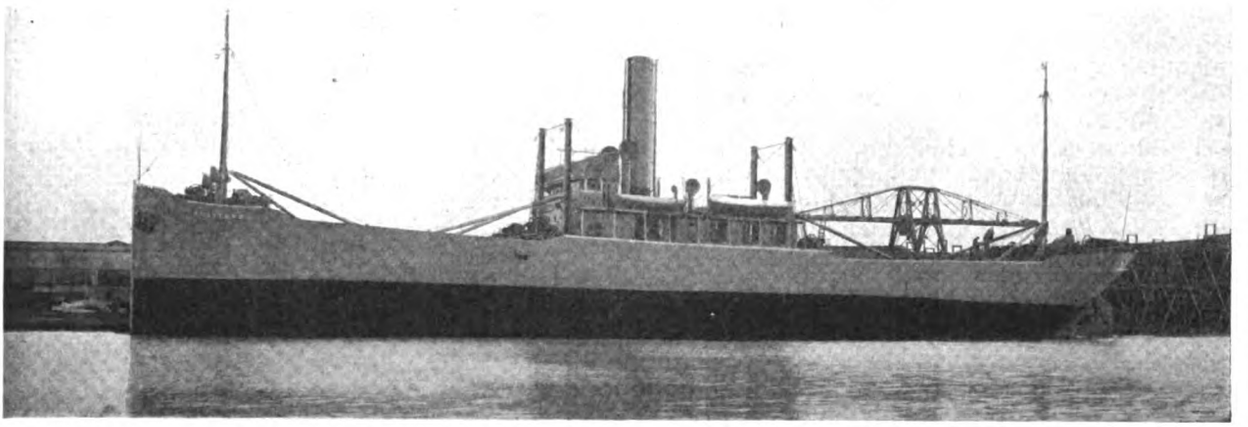
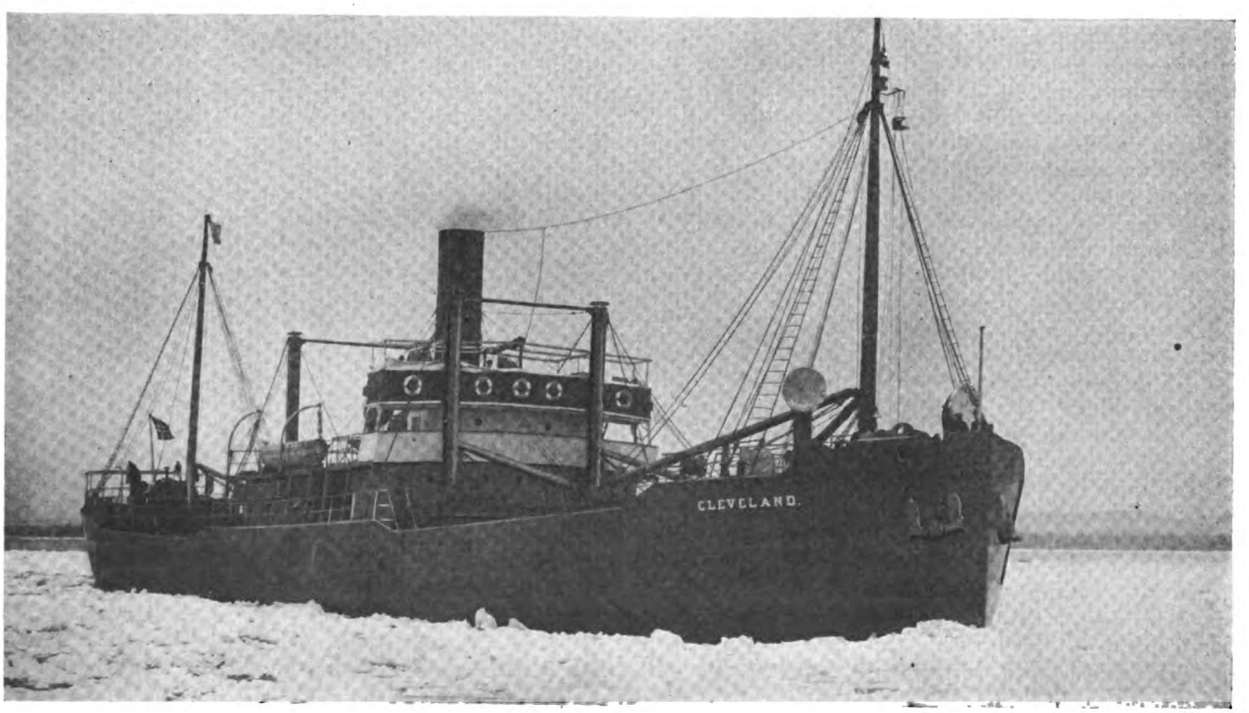
American-Made Ships Built in 1917



The small lake cargo carriers as well as the huge ocean freighter are playing their part in backing up America's war ultimatum. The Baltimore-built freighter at the left is the General De Castelnau, with a capacity of 6200 tons. The Poitiers and Cleveland were built at Superior, Wis., for salt water service. The Cleveland is bucking lake ice on her way to the ocean.





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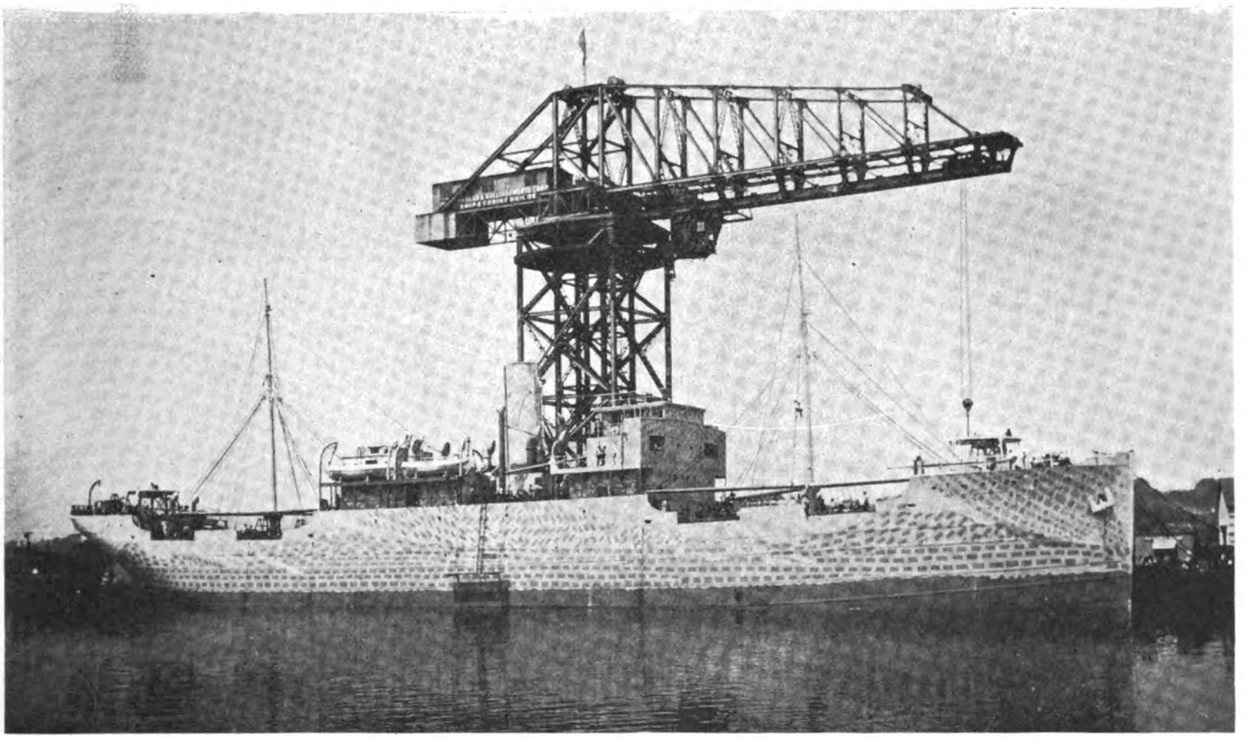
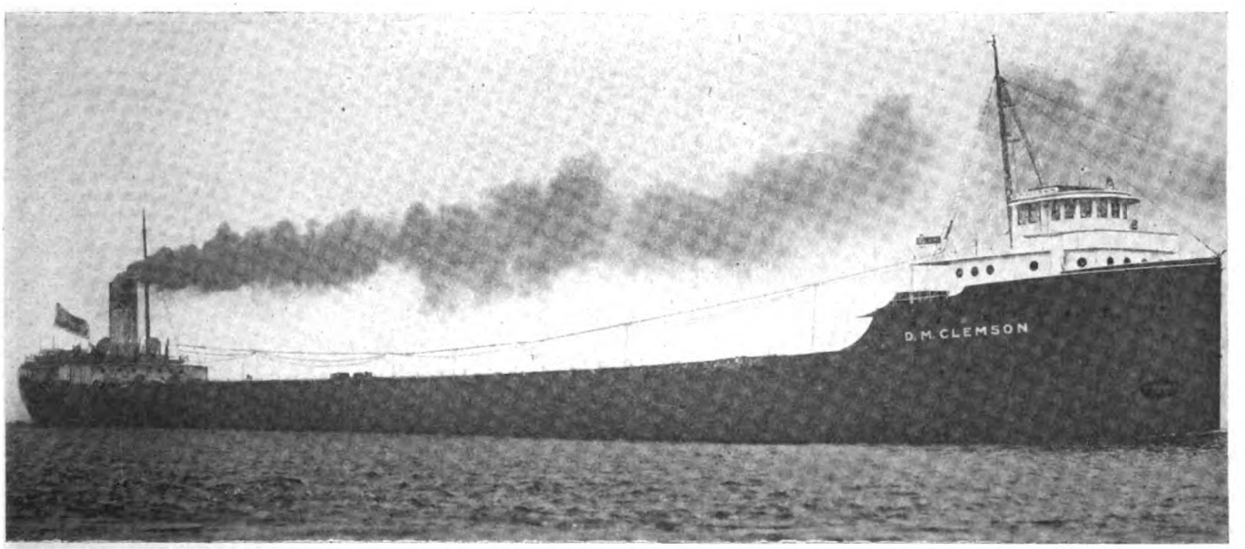
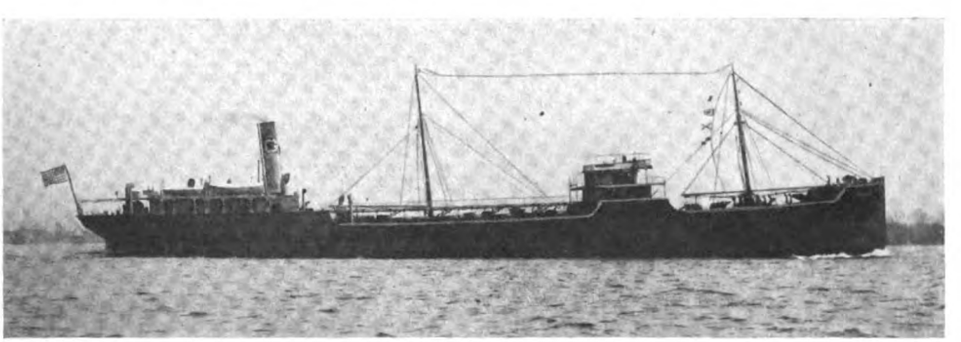
New Steamships for Sea and Lake





Ocean tankers and lake bulk freighters are both important cogs in America's war machine. Olean, above, painted on a low-visibility scheme, was built at Wilmington, Del. Clemson, a 12,000 ton lake ore carrier, was built at Lorain, O. Gulfmaid is a Camden, N. J. product.



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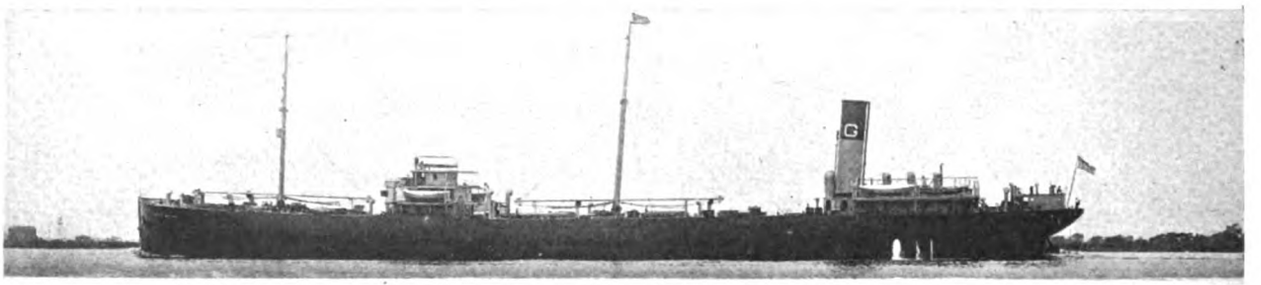
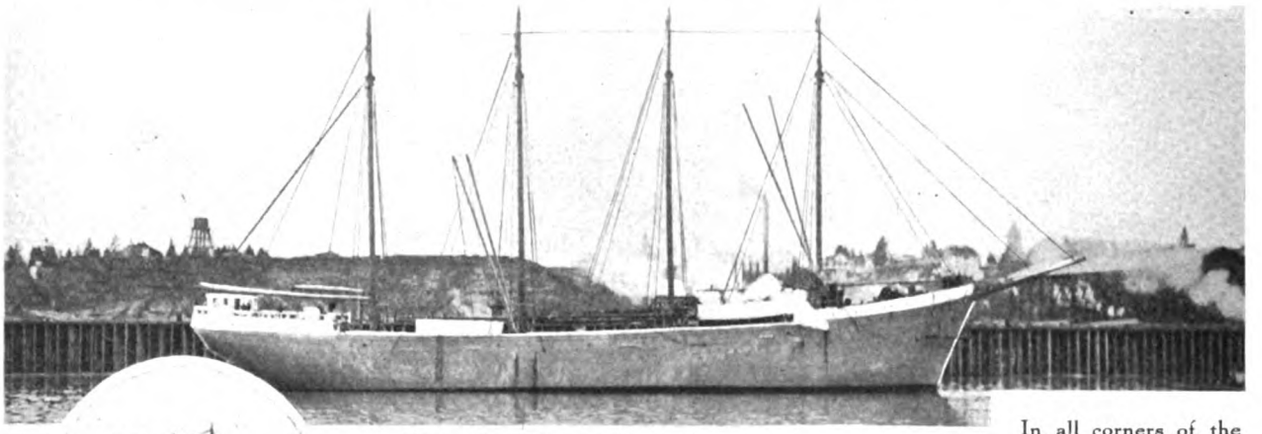
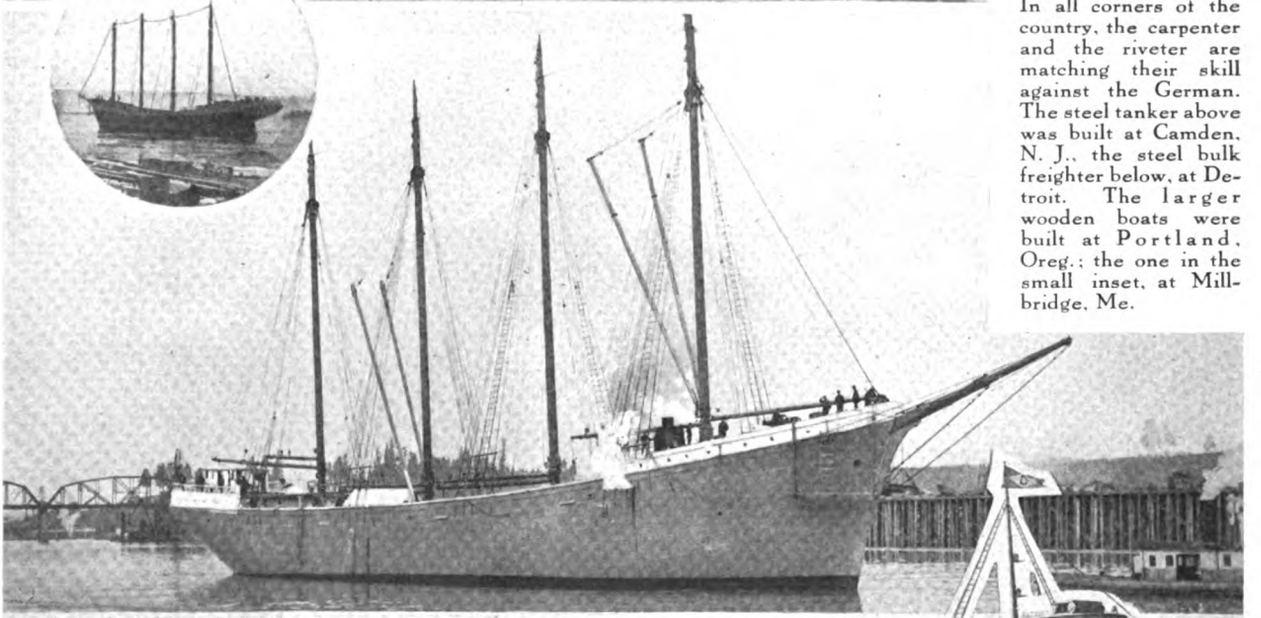
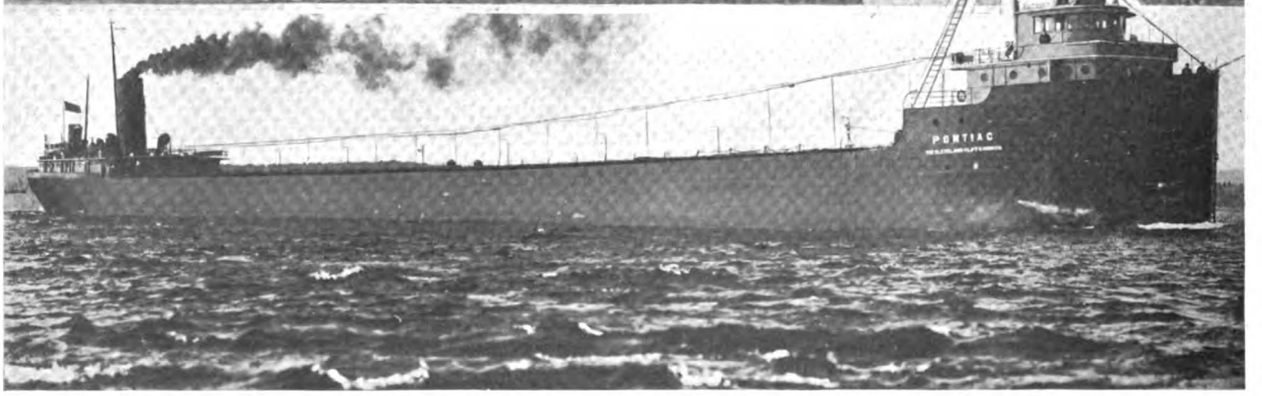
New Wooden Vessels Vie With Steel





In all corners of the country, the carpenter and the riveter are matching their skill against the German. The steel tanker above was built at Camden, N. J., the steel bulk freighter below, at Detroit. The larger wooden boats were built at Portland, Oreg.; the one in the small inset, at Millbridge, Me.





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How Wooden Ships Are Built—IX

Construction of Hold Beams and Stanchions—Deck Beams and Deck Planking—Methods of Caulking and Finishing the Deck

By H. Cole Estep

WOODEN ships are held together internally by various combinations of timbers, the most important of which are the beams which connect the upper ends of the frames. These beams are covered by deck planking and usually they are supported in the middle by posts or stanchions. In large ships, two rows of beams are inserted, known respectively as hold beams and main deck beams. The ends of the beams are secured either by wooden or steel knees or by a shelf and clamp construction, the details of which will be described later. There is some doubt among modern shipbuilders of the efficiency of beams for tying the upper parts of the ship together and resisting twisting strains. It is pointed out that the nature of the connection between the beam's ends and the sides of the vessel is such that the beams should be considered as supported and not fixed. In order to give the deck construction more strength, therefore, most modern ship builders resort to the use of longitudinal or diagonal steel straps. The former usually extend right fore and aft under the waterways and alongside the hatches. Where diagonal straps also are employed, they are arranged in the shape of a lattice or simple truss between the hatchways.

The necessity for hold stanchions or posts is evident from a consideration of the strains to which the ship is subjected when empty. In such a case, the bottom must resist the enormous upward push of the water and as stated in one of the earlier chapters in this series, many wooden vessels have been found insufficiently strong to resist these forces, with the result that the bottom has caved upward. This has occurred even where hold stanchions are provided in the ordinary manner. In such cases, however, the bulging is not nearly as great as it would be if there were no stanchions. When, on account of weak floors, such bulging occurs with the stanchions in place, the deck beams are lifted up at the center and the round of beams is exaggerated.

Contrasting Methods

Two contrasting methods of framing hold stanchions are shown in Figs. 154 and 155, and 156 and 157, respectively. In the former case, the stanchions, which are of relatively light cross-section, are arranged in pairs. These pairs face athwartship in the way of the hatches and longitudinally between the hatches. A detail of the stanchion footings is shown in Fig. 154, which indicates how the lower ends of the stanchions fit onto the wide, flat keelsons. It will be noted that a hardwood block is provided to take the thrust and that the footing is further reinforced by short sections of angle iron. The details and dimensions of this framing are given in Fig. 40, in the chapter published in the September issue of THE MARINE REVIEW.

A more conventional type of hold framing is shown in Figs. 156 and 157. This illustrates the framing of a 290-foot, 5-masted auxiliary schooner which is provided with both hold and main deck beams. It is readily apparent that there is a more lavish use of timber than in the design shown in Figs. 154 and 155. The stanchions shown in Fig. 157 are divided into two section by the hold beams. The lower section foots on the center girder-keelson. The stringers, or caps, carrying the deck beams are shown clearly in

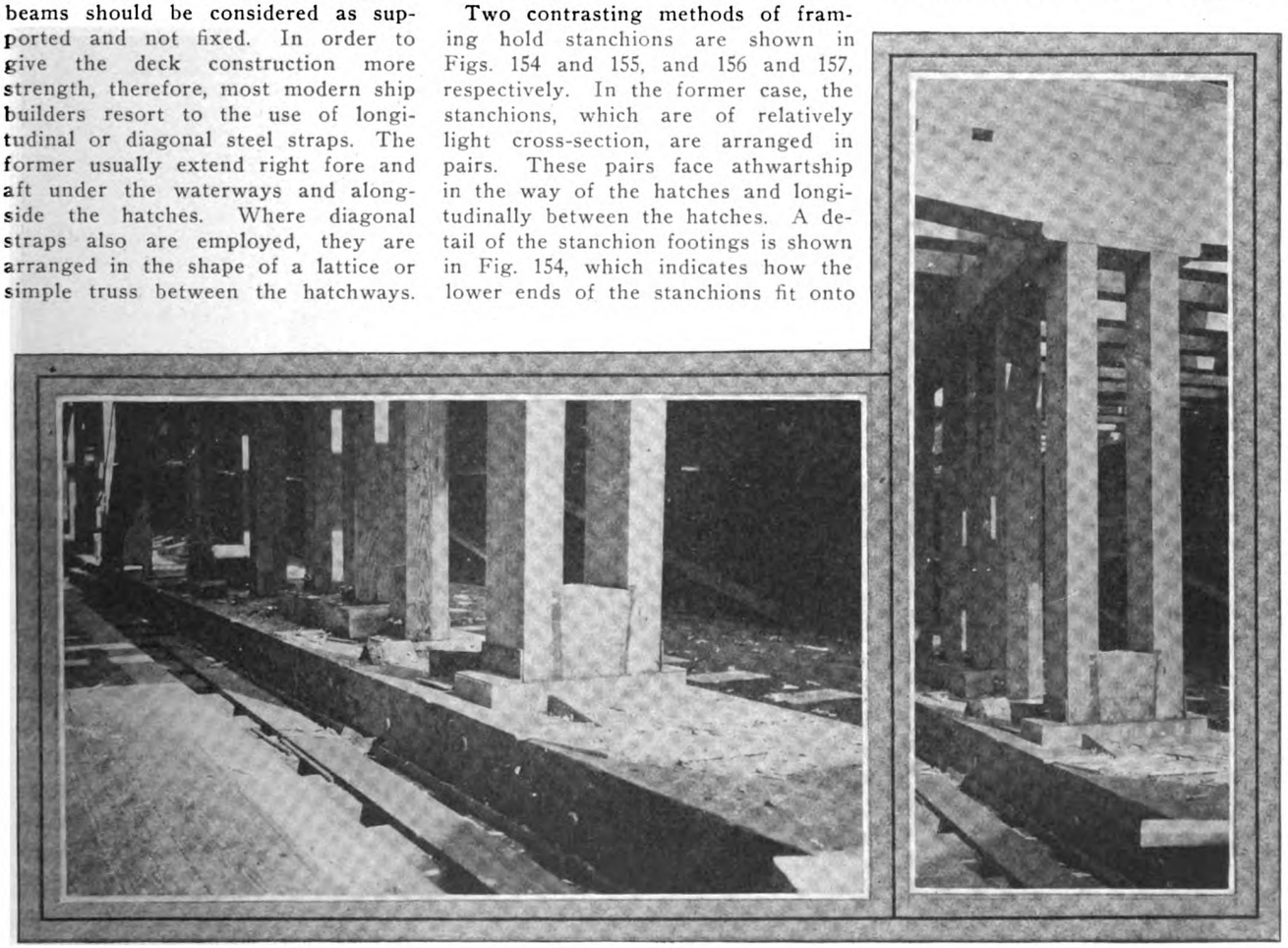

FIG. 154—DETAIL OF STANCHION FOOTINGS IN A LARGE WOODEN SHIP. FIG. 155—GENERAL VIEW OF STANCHIONS IN THE SAME SHIP

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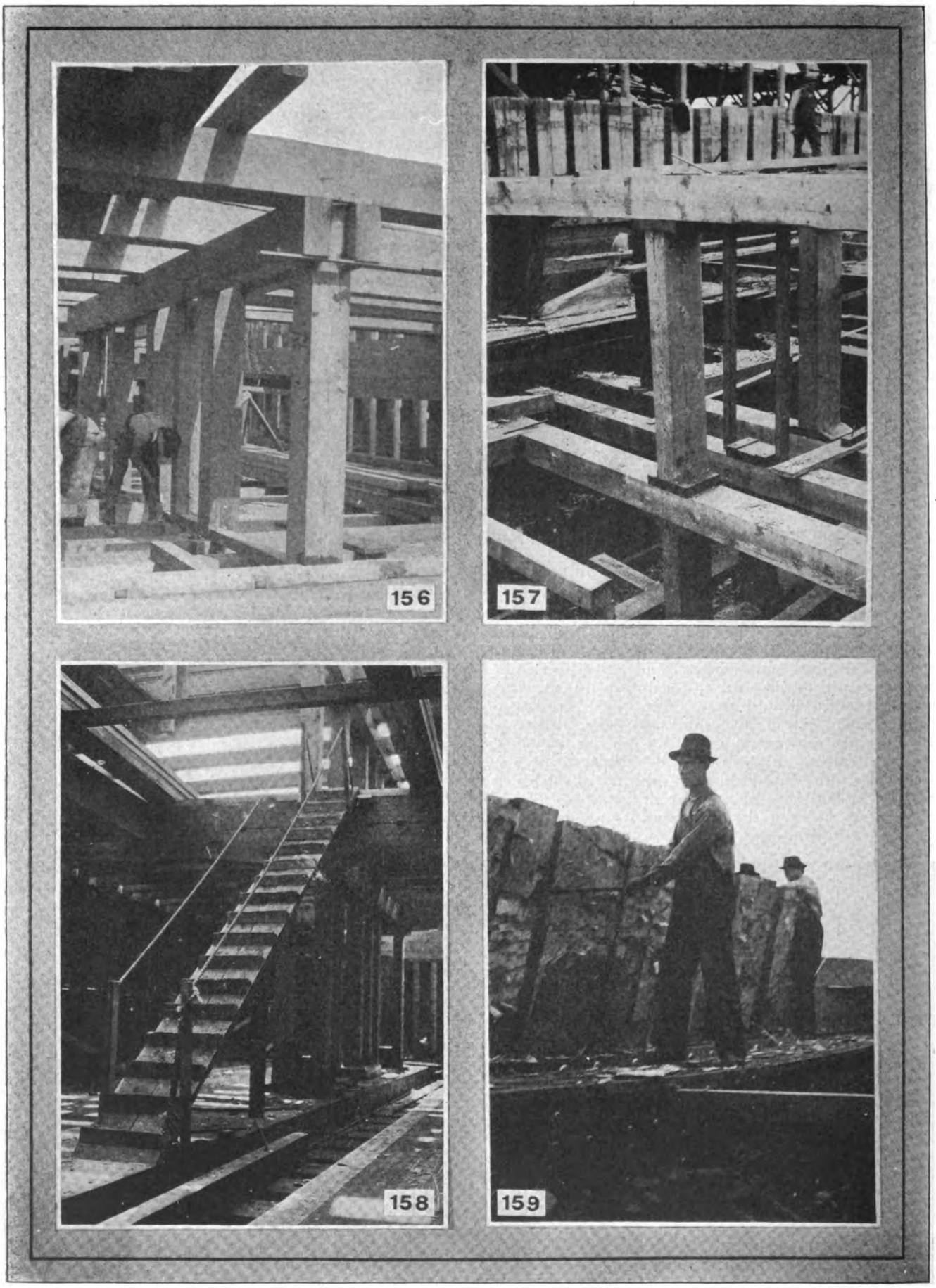

FIG. 156—STANCHIONS BETWEEN MAIN AND LOWER DECK BEAMS. FIG. 157—GENERAL VIEW OF HOLD FRAMING. FIG. 158—SAFETY LADDER INSIDE SHIP. FIG. 159—DUBBING-OFF STERN BULWARKS

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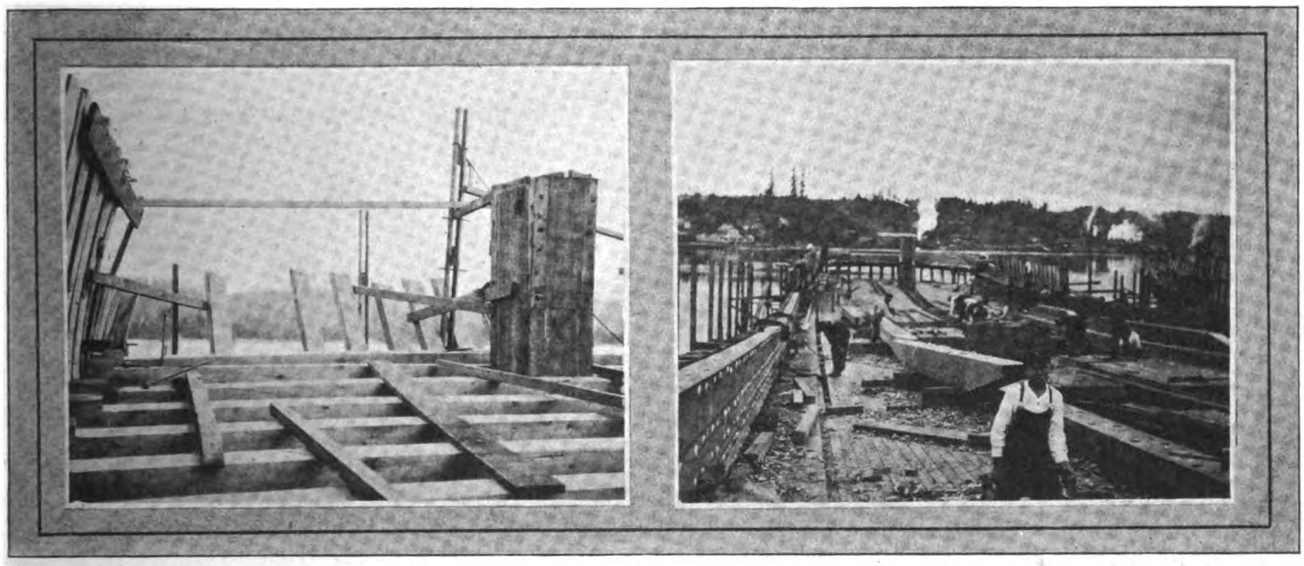

FIG. 160—ARRANGEMENT OF DECK BEAMS NEAR STERN. FIG. 161—DECK OF WOODEN MOTOR SCHOONER NEARLY COMPLETED

Fig. 156. Further details and dimensions of this framing may be obtained by referring to Fig. 36, published in the September issue of THE MARINE REVIEW.

Incidentally, it might be stated that many wooden ship builders fail to appreciate the necessity for providing safe entrances and exits to their vessels during construction. Scaffolding and ladders of the flimsiest character are often considered sufficient. As a result, accidents have been abnormally high in wooden shipyards. The resulting loss may be readily avoided by giving a little thought to the subject of safety. Fig. 158 shows how one ship builder in Portland, Oreg., solved the problem of providing a safe entrance to the hold by building a cheap, strong plank stairway which was properly protected by rope rails.

Two different forms of deck beam construction are shown in Figs. 164 and 165, and 162 and 163, respectively. In either case, the ends of the deck beams rest on a line of timbers secured to the inside surface of the frames. This combination of timbers is termed a shelf. In some cases, however, the topmost timber only, which carries the direct weight of the beams, is called the shelf, the timbers immediately underneath being known as clamps. The shelf is fastened with bolts, as shown in Fig. 164; ordinary drift bolts clenched on the inside usually are employed, although in some cases, as in Fig. 162, through bolts provided with nuts and washers are used instead.

In the construction shown in Fig. 164, which is the more usual type, the ends of the shelf or clamp timbers are simply butted together. In the vessel shown in Fig. 162, these timbers are scarfed at the joints. Considerable difference of opinion exists with reference to the utility of scarfing the various lengths of timber composing the shelf. Some builders advocate the necessity of so doing on the ground that the greater the number of plain butts in the length of the ship, the less the resistance offered to such changes of form as sagging and hogging. It is claimed that by preserving as far as possible continuity of strength in the shelf, the ship is materially aided in resisting strains. This has been urged more especially in the case of large ships. On the other hand, it has been maintained that the scarfing of a single course or so of longitudinal timbers can afford but little additional

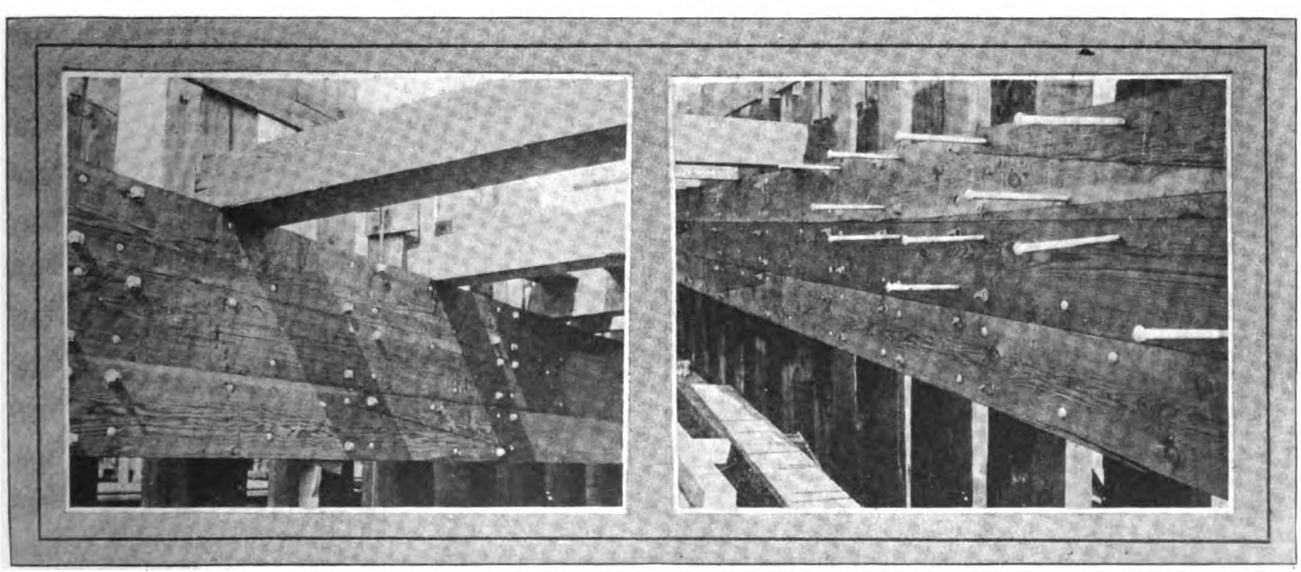

FIG. 162—DECK BEAMS RESTING ON SHELF, BOLTED CONSTRUCTION. FIG. 163—DETAILS OF FASTENINGS OF SHELF AND CLAMP

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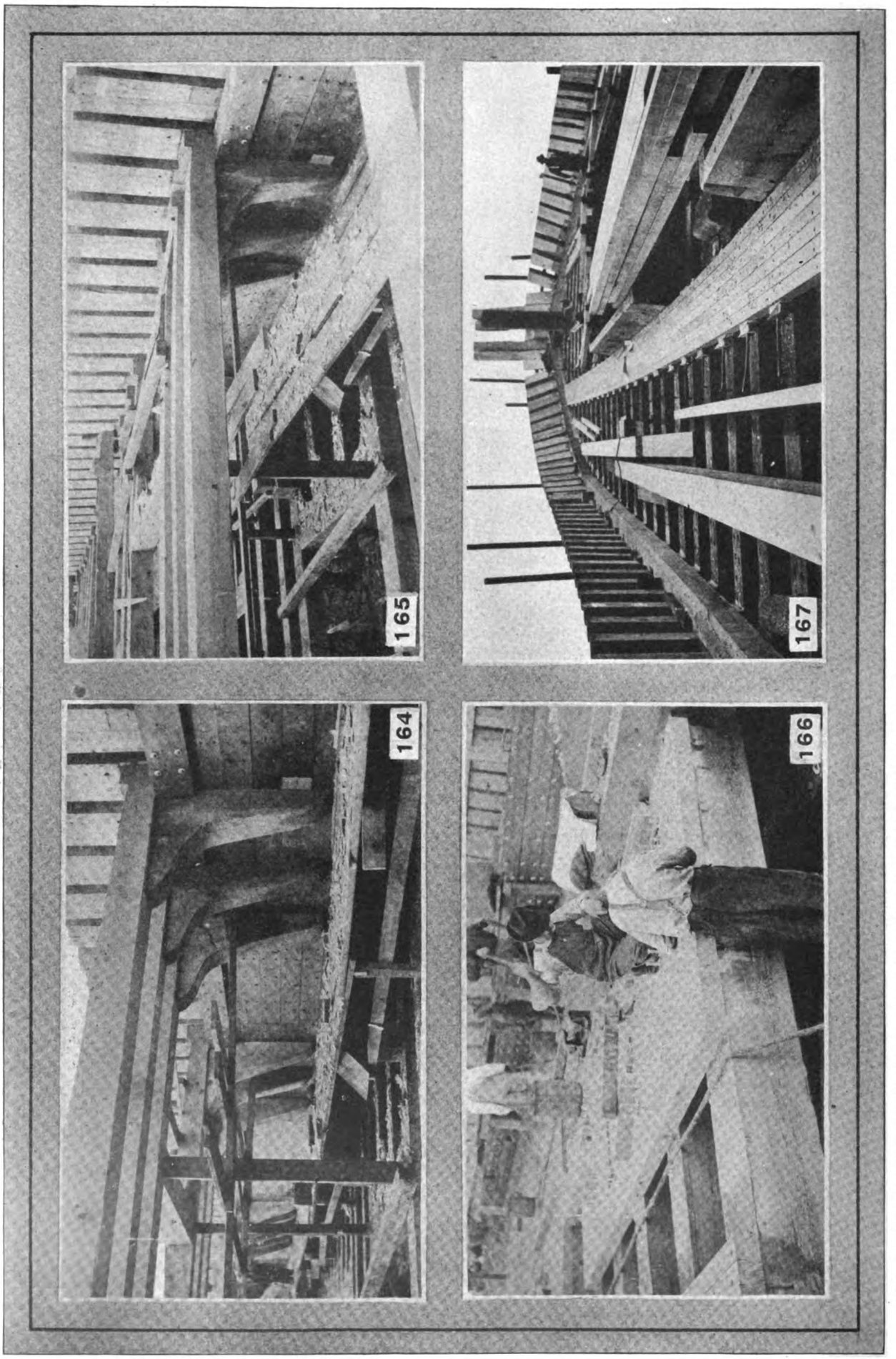

FIG. 164—MAIN-DECK BEAMS WITH HANGING KNEES IN PLACE. FIG. 165—MAIN DECK BEAMS FITTED TO SHELF. FIG. 166— SPIKING DOWN DECK PLANKING.
FIG. 167—CLAMPING DECK PLANKING IN PLACE

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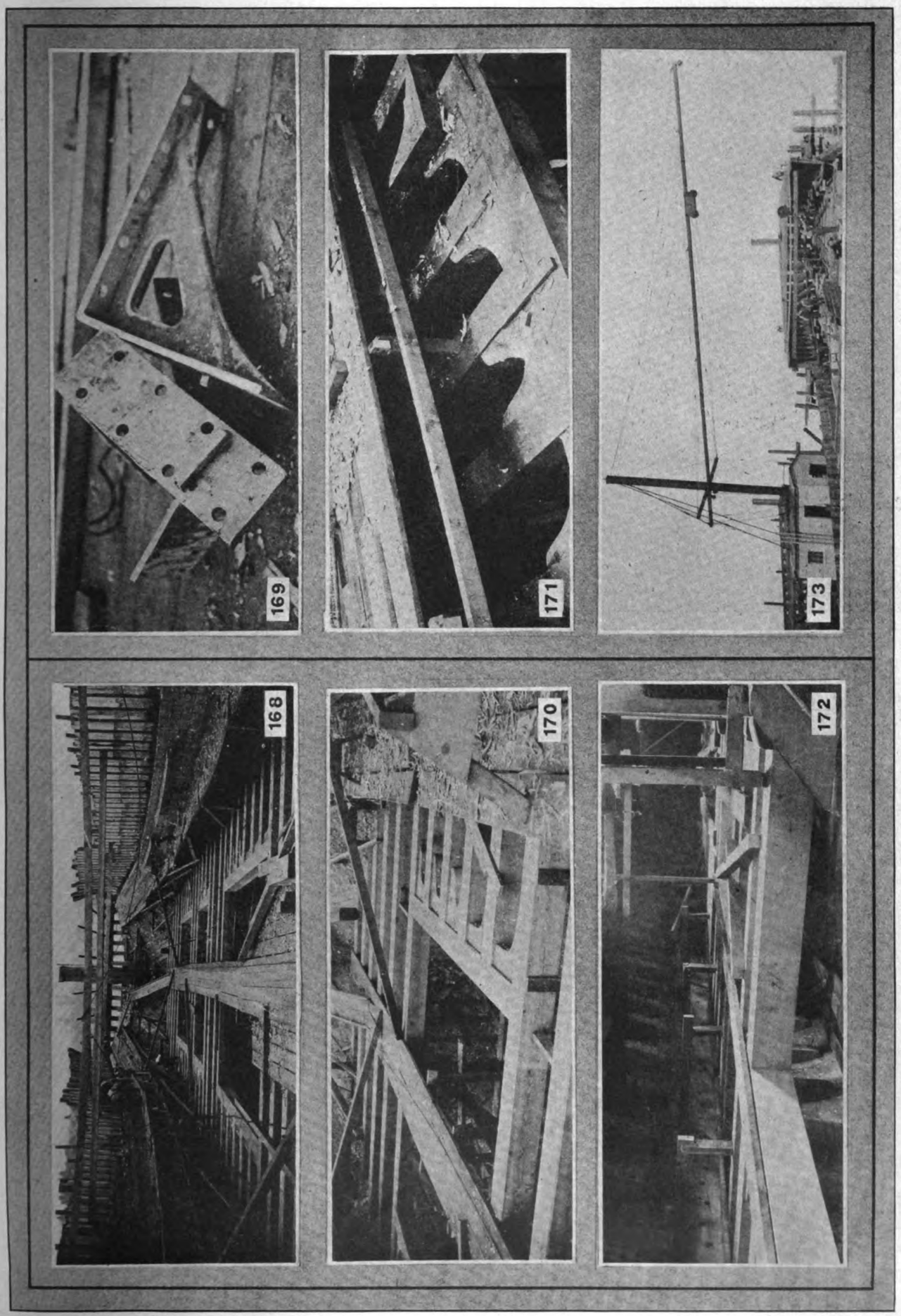

FIG. 168—GENERAL VIEW OF HOLD BEAMS SHOWING LUMBER CHUTE. FIG. 169—DETAIL OF CAST STEEL KNEES. FIG. 170—HOLD BEAMS IN THE WAY OF A HATCH. FIG. 171—LODGING KNEES IN THE WAY OF A HATCH. FIG. 172—DETAIL OF HATCH BEAM CONSTRUCTION. FIG. 173—CRANE USED FOR SETTING DECK BEAMS

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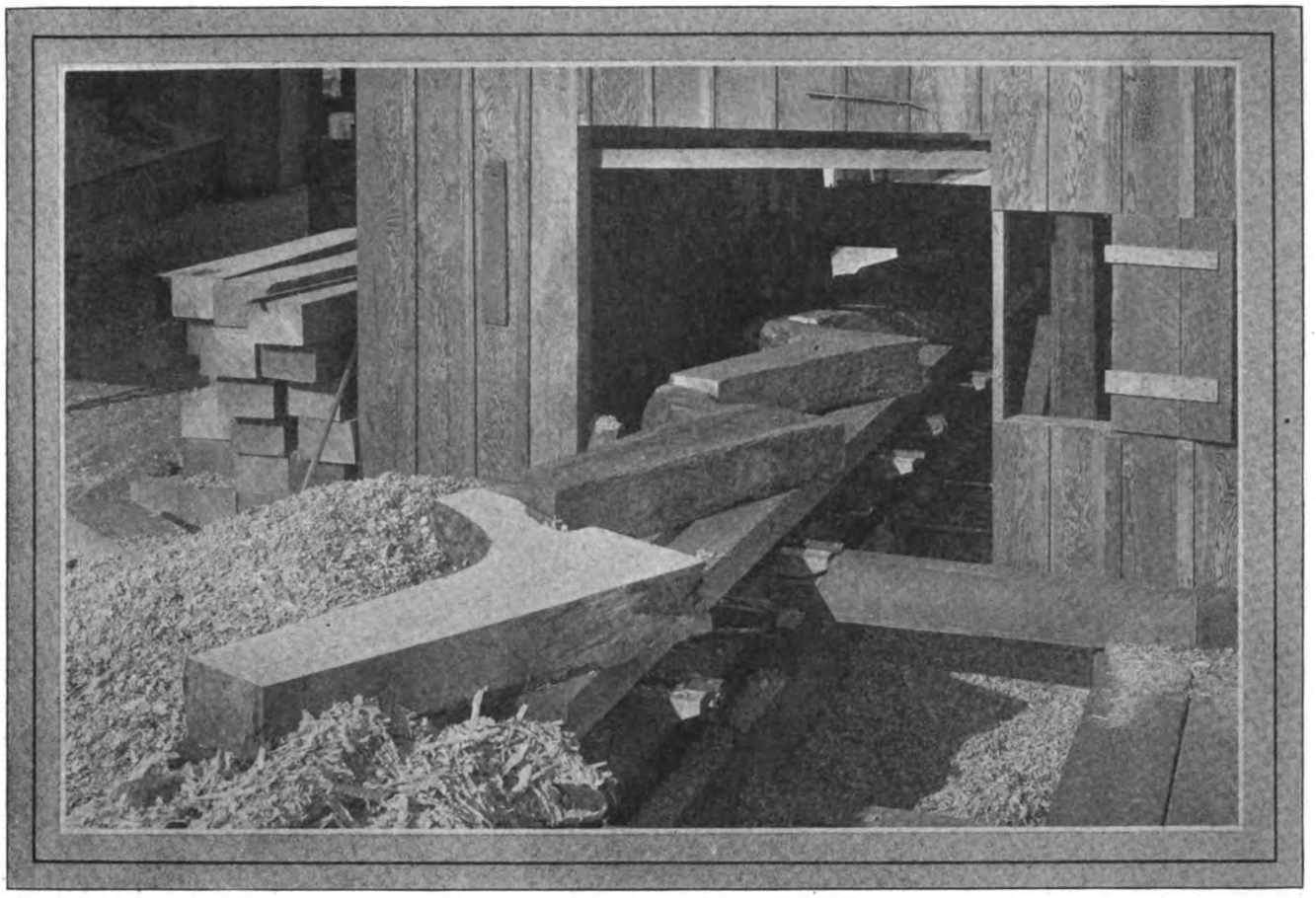

FIG. 174—SURFACING KNEES ON A SPECIAL PLANING MACHINE—KNEES ALSO ARE FAYED ON THIS MACHINE IN LOTS OF 10 OR 12, THE OPERATION REQUIRING ONLY 15 MINUTES

support and that the benefits derived are not proportionate to the expense involved. There is no doubt, however, that the scarfed joint is the stronger of the two.

As soon as the shelf is in place, the exterior planks opposite it may be trimmed and fitted. When this is done, the whole constitutes a very rigid ribband which preserves the form of the ship while the remainder of the plank is put on. Usually the beam knees are not filled until some considerable time after the shelf is put in place.

Lloyd's rules require that for ships whose length is five times their breadth, and between eight and nine times their depth, the sectional areas of shelves and waterways shall not be less than that of the beams, the latter being determined by a table giving the scantlings according to the breadth of the ship amidships. The rules also require that the breadths of the faying surfaces of such shelves shall not be less than the siding given for the beam. When the fastenings are of iron, they need not go through the exterior planks, but may be clenched either on the inside of the shelf or outside of the timbers. If copper or yellow metal fastenings are used for any purpose, they must be clenched on the outer planks.

Beams Perform Two-Fold Service

As previously suggested, the beams perform the two-fold service of connecting the sides of the ship and of forming the foundation for the decks which carry out the internal economy of the vessel. Besides this, the beams, in combination with the deck planks form a continuation of the frames and planking, it being evident that when the ship is rolling and working heavily in a seaway, the deck and beams at intervals are subjected to the same strains as the frames and the outside planking.

Usually, the framing of a wooden deck consists of beams, half beams and carlings. The beams are those which extend continuously from one side to the other. Half beams are short beams of reduced scantling which extend from the side to fore and aft pieces of deck framing termed carlings. The latter are fitted between

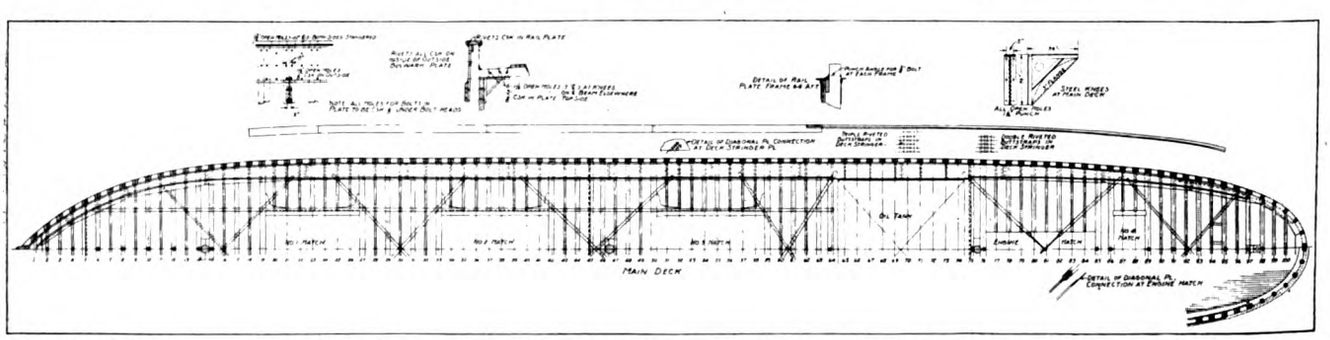

FIG. 175—SECTION OF DECK FRAMING OF LARGE WOODEN SHIP SHOWING METHOD OF REINFORCING WITH STEEL PLATES AND STRAPS

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the beams. The arrangement of the deck framing is given in the design of the ship and is adapted to the required position of the hatchways, companionways, etc. The beams are cut with parallel siding and molding, the upper surface being formed to the curvature of a circular arch. The versed sine of this arch is termed the round-up of the beam. This curvature prevents the water from lodging on the deck and adds to the bearing power of the beam when its ends are fixed.

In modern yards the beams usually are trimmed on a band saw or edging machine. For this purpose, beam molds or tables of dimensions are provided. The molds may be prepared in the mold loft in the following manner:

The line of the beam at middle is rased or scratched in on the floor in the body plan, being copied into that plan from the sheer plan by measuring square to the base line the height at which the beam at middle line in sheer cuts each square station, transferring these heights to the body plan square to the base line. The midship beam itself also is drawn in the body plan, being copied from the midship section. The distance between the beam end and the beam middle lines at any square station in the sheer plan is evidently the round-up in the length of the beam. Therefore, having given the latter line, together with the curve of the longest beam and the length of the beams in the deck under consideration, the former line is at once determined by setting the

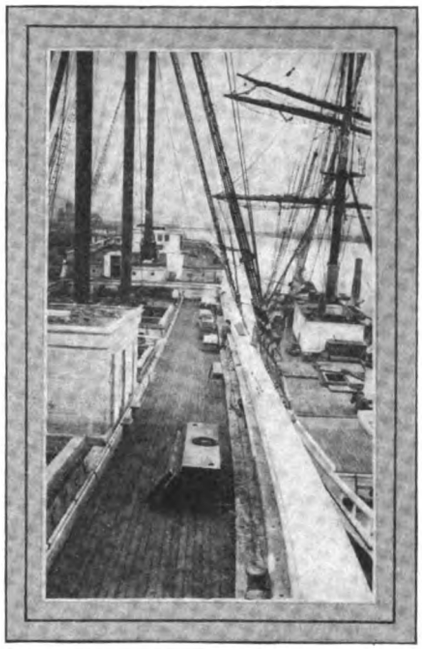

FIG. 176—DECK OF LARGE WOODEN MOTOR SCHOONER

amount of round-up for the beam at each square station below the latter, passing a curve through the points so obtained. The curve of the beam itself is that of an arc of a circle. Since this circle is necessarily of very large radius, the portion of it that is required may be most conveniently constructed by certain simple methods explained in most works on plane geometry or mechanical drawing.

After the inside of the ship has been dubbed-out fair, it is a good idea to rase in the line for the beams on the ship's side. The first operation in getting in a line of a tier of beams is that of marking a straight line on the ship's side at or near the height of the beam at middle line amidships. The straight line is drawn first on the sheer draft and its height is measured from the keel. Three boards are then put across from side to side, one being near each extremity of the ship and one at the middle. These boards should be set perfectly horizontal by means of a spirit level and they are so placed that the upper edges of the two extreme boards are at the height of the straight line, and out of winding with the lower edge of the middle board. This is done by looking across the edges or sighting as it is termed. Battens then are fixed along the inside of the ship. The end batten is so placed that its upper edge coincides with the upper edges of the two extreme base boards and the lower edge of the middle board. The intermediate portions of the upper edges of the battens are looked level with the three edges of the baseboards, and the straight line

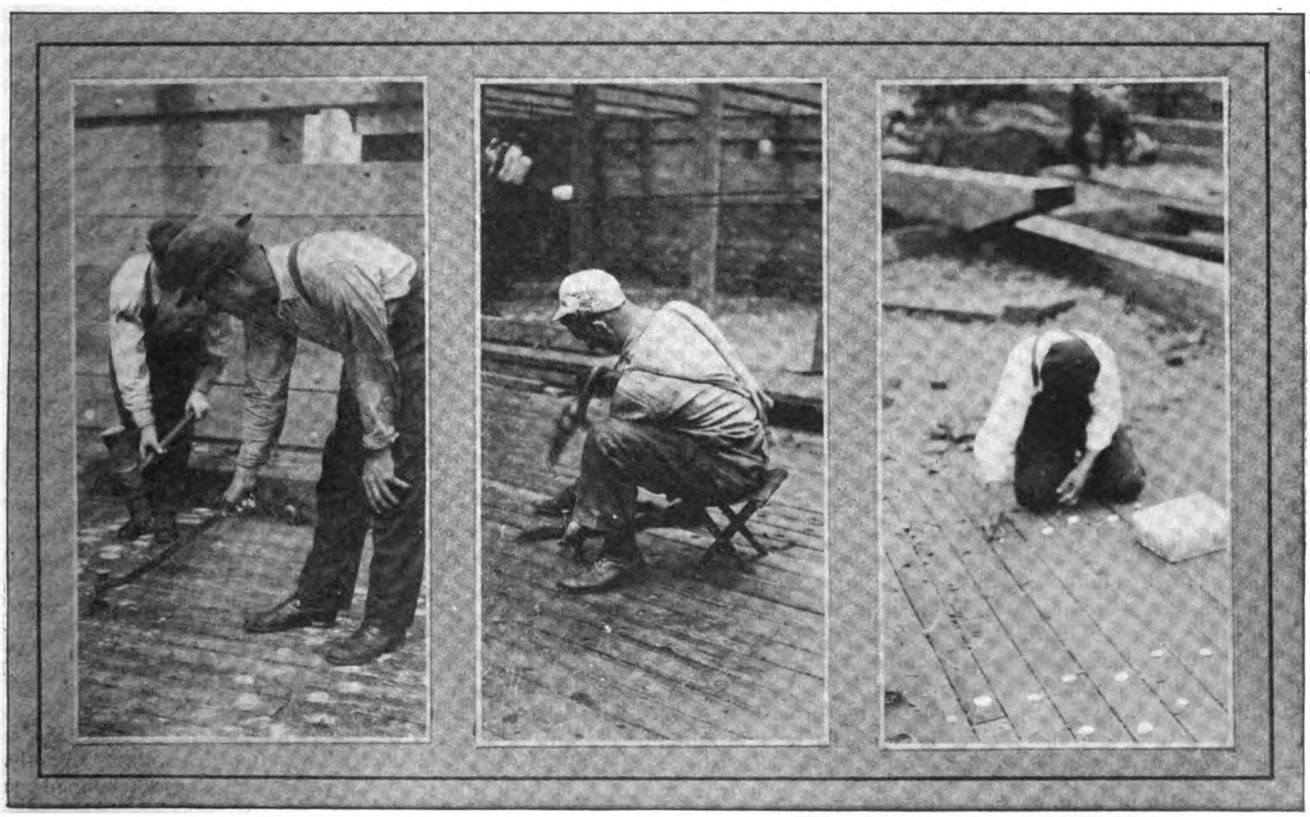

FIG. 177—CAULKING DECK USING HEAVY MAUL. FIG. 178—FINISH CAULKING. FIG. 179—INSERTING PINE PLUGS OVER SPIKEHEADS IN DECK

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is thus sighted on the inside surface of the frames. This line is then rased in on the timbers, after which it may be painted so as to be readily distinguishable. In this way a straight line may be put in on both sides of the ship at the same height above the keel.

Next, the perpendicular distance between the straight line and the beam at middle line in the sheer draft is measured at every square station or frame station. A small cord is now set to cross the ship at each square station, being kept to the straight lines already drawn on each side of the ship. In this position a spirit level is sometimes applied to the cord to prove the agreement of the straight lines on the ship's side. The distances measured from the drawing are then set up from the cord, square to the base line, at the respective square stations, and the points so found are marked on the inside surface of the timbers on both sides of the ship. A line drawn to all the points by aid of shearing battens, gives the shear of the deck or the projection of the beams at middle upon the sides of the timbers.

Marking in the Lines

The beams at side line, that is the line of the upper side of the beam ends, is then found by measuring from the beam mold the round down of the beam in the breadth of the ship at each square station, and this distance is set down square from the line of the beams at middle. The spots so found are marked on the timbers. A line drawn through all such points, by the aid of shearing battens, is the line of the beams at side. It is evident that by setting beneath this line, the molding of the beam, minus the snapping of the end, we obtain points in the line of the upper edge of the shelf, which line can then be drawn by the aid of shearing battens.

For trimming the shelf, molds may be made to the curvature of the side and the amount of shear determined by spilings taken from a straight line drawn on the inside of the timbers, adjacent to the line of shelf, for the length of the piece to be trimmed. These spilings are set off from a corresponding straight line drawn on the timber when trimming it.

The correct section of the shelf amidships is given in the design and the shelf is kept the same siding and molding throughout its entire length. The upper side usually slopes slightly inward and the under side is more frequently parallel to the under side of the beam than square to the surface of the timbers. At the extremities of the ship, the shelf usually is tapered away to the thickness of the clamps or ceiling.

Two types of knees, wood and steel, respectively, are shown in Figs. 164 and 169. Knees may be either hanging or lodging, that is, vertical or horizontal, as shown respectively in Figs. 165 and 170. The chief function of knees at beam ends is to preserve a constant angle between the beam and the ship's side, it being evident that the working of a ship in a seaway tends to alter that angle. Considerable difference of opinion exists regarding the relative efficiency of natural-bent wood knees, such as shown in Fig. 165 and the cast steel knees illustrated in Fig. 169. The latter are about 4 feet 6 inches on a side and ⅞ inch in section. They are, of course, much stiffer than the wood knees; they also are lighter and less unsightly. It is claimed by some builders, however, that their very stiffness is undesirable, it being the contention of these shipwrights that all parts of the ship's structure should work together. On the Pacific coast, natural wood knees can be obtained in almost any size, with arms up to 8 or 10 feet length and thicknesses up to 24 inches. In some cases, the clamp and shelf construction is so arranged that the use of hanging knees under the beams is obviated.

The length of a wooden beam usually is measured at the tip. This can be done either by measuring the breadth of the ship straight across, at the level of the upper edge of the beam, then applying this length to the beam mold, and measuring the length of the curved edge of the mold in the straight distance, or it can be done by putting the beam mold in place and marking-off the length on it. By the latter method the beveling of the beam ends, if any, can be marked on the mold at the same time.

To Take the Snape of a Beam

In order to take account of the snape of the beam end, also of the beveling and length at one time, whether the beam is at its correct round or not, the following is an ordinary method:

A batten is placed across the ship at the position of the beam to be fitted, and the upper edge is kept in touch with a cord stretched tightly across the ship and secured to the beam end line at each extremity. A piece of mold is then made to the shape of each of the beam ends. These molds are nailed to the ends of the batten, while the latter is in the position already named. The battens with the end molds are then laid upon the beam to be cut. The ends may now be marked by the molds and in order to be sure that the beam fits closely against the timbers, it is customary to allow an extra length of say ¼ to ¾ inch, in proportion to the length of the beam, the exact amount being regulated by a slip of wood kept by the workman who thereby makes it certain that all of the beams are wedged in equally. The fore and aft bevelings of the beam ends, if any, are taken with a bevel held against an athwartship line and the inside of the timbers. It is of the utmost importance that the beams should fit closely against the frame timbers. A close joint is popularly said to be half the fastening and nowhere is this more true than in the case of beams.

Steel Tape May Be Used

In a good many American shipyards where speed is the chief consideration, these precautions to insure correctly fitted beams frequently are omitted, simple measurements with a steel tape taking their place. Very often this does quite well, but if a well-built ship is desired, too much care cannot be taken in fitting its parts together.

After the beams are laid and prior to planking the deck, it is necessary to arrange for the deck furnishings. These fittings consist of hatchways, scuttles, match partners, bitts, bollards, capstans, etc. The sides of the hatchways are formed with carlings which are scored into the beams. Coamings and headledges are bolted above the carlings, the former being placed in a fore and aft, the latter in a transverse or athwartship direction. They are referred to by the general name of coamings, and extend to a sufficient height above the deck plank to prevent water from getting through the hatchway under ordinary conditions.

The mast holes of a ship with wood beams are framed with a series of carlings termed fore-and-aft partners, cross-partners and angle-chocks, the whole forming a hole the diameter of which exceeds that of the section of the mast usually by twice the thickness of the mast wedges. The latter vary from about 3 inches to 6 inches, according to the size of the ship. The framing for capstans, bollards, riding bitts, etc., are built up simply of carlings fitted so as to form a solid resting place or bearing for the fiting in question.

The deck planking for American wooden ships of normal size usually consists of 5-inch square, edge-grain fir or yellow pine timbers laid longitudinally, as shown in Figs. 166 and 167. The latter illustration shows how the deck planks are clamped and wedged into place before being spiked

(*Concluded on page* 85)

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Japs Gain Firmer Hold on Pacific

Orientals Reap Golden Harvest in Western Waters—Allies Dictate to Norwegians Through Control of Coal Supplies—Pacific Tonnage Being Diverted to Atlantic

By R. C. Hill

IN YEARS to come, shipowners and charterers will undoubtedly turn back to the annals of 1917 when they wish to find the high records of the charter market. On the Pacific coast, 1917 has set a new mark with respect to top notch freights and high prices paid for tonnage. Before the war closes, still higher levels may be reached but this is improbable, owing to the government restrictions and regulations recently put into effect.

From every angle of chartering and selling vessels, 1917 stands out in bold relief. With two slight reverses, one during the early spring and the second in September-October, the charter market registered a constant advance during the last 12 months. This applies not only to the Oriental trade, in which tramp steamers are engaged, usually fixed on a time basis, but also to lumber carriers, mostly sailing vessels which are chartered on a basis of per thousand feet for certain foreign ports.

Japan Ignores U. S. Rate

Since the United States shipping board has decreed that no American citizen may charter a tramp steamer at more than 45s ($10.95) per deadweight ton per month, a maximum has been established for this class of tonnage which must be observed by all but Japanese owners. It is understood that the United States and Great Britain have agreed upon this maximum rate, and pressure is being brought to bear upon other nations operating vessels.

In the case of the Norwegians, the maximum rate can be applied although the hardy and far sighted Norsemen, who have always been a factor in transpacific trade, are not accepting the ultimatum with the best of grace. However, conditions are such that the Norwegians must give way; because on this coast the United States and Great Britain control the fuel supplies without which the Norwegian fleet would be helpless. Because the Norwegians were not willing to accept the comparatively lower freights, several of their vessels have been held idle in Pacific ports for weeks at a time. Reports from British India tell of such instances and at Seattle and San Francisco other Norwegian ships have been detained for from one to three months until the conditions of their charters were approved by the governments that control the vital supplies of coal and fuel oil.

On the other hand, the Japanese, who practically control the tonnage situation in the north Pacific, are still establishing the market value of steam charters. Japanese owners are asking as high as from 70 to 75s ($17.08 to $18.25) for their ships. Inasmuch as American charterers are debarred from engaging in chartering at these fancy rates, the Japanese are free to charter among themselves. The reason Japan has the upper hand in this field of frenzied deep seas chartering is that she has her own coal supplies.

Table I

How Japan Will Dispose of New Ships

	Tonnage
Sold to Great Britain	148,605
Sold to France	23,229
Sold to Italy	5,600
For service between Japan, United States, Russia and British territories	51,259
For service between British territories	16,700
Not fixed	*87,191
	332,654

*Likely to be sold to the allies but not decided.

Not only are the allied governments endeavoring to keep down the cost of ocean transportation but pressure is being brought to bear to equalize the distribution of tonnage. Japanese and Norwegian owners naturally prefer the safe lanes of the north Pacific to the submarine-menaced waters of the Atlantic. However, the shortage of tonnages between the Atlantic-American coast and Europe is acute and the allied governments are applying pressure for the diversion of steamers to the Atlantic.

Steamer Delayed Many Months

An instance may be cited of a Norwegian steamer, which was delayed on this coast nearly two months because, as reported, the British admiralty refused to consent to the terms of the charter and to other conditions. It was desired to send the vessel to the Atlantic. The owners demurred and it is understood that the steamer was finally permitted to make another voyage to the Orient after which it is stipulated she will go to the Atlantic. And to add further interest to the case, she was chartered at a figure below the maximum, said to be about 41s 6d $(10.12).

It is difficult to state what will be the immediate future of transpacific freights. While the Japanese are holding to market levels, the fact that British and American firms can not fix Japanese rates may bear the market to some extent. On the other hand, there is so much freight to be moved across the Pacific that Japanese owners may find sufficient demand among their own people to keep freights up to today's levels. The more likely outcome will be that the Japanese eventually will be compelled to meet the maximum now set, with the probability that their government will reimburse Japanese owners for the difference between the current market and the allied government maximum.

It can easily be seen how the Japanese are dominating the transpacific trade. The Japanese not only have the ships and are adding rapidly to their number, but with their own fuel supplies they are not subject to the pressure that can be applied to ships of other nations.

How Japan Controls Pacific

Ten years ago a Japanese steamer was a novelty in Puget sound waters. Today the Nipponese practically control the trade. In the last three years 100 different Japanese steamers, with an aggregate cargo capacity of 653,202 tons have visited Seattle. This table does not include a dozen regular liners which call there three or four times annually. Recent figures show that Japanese tonnage constituted between 70 and 80 per cent of transpacific commerce. With American, British and many Norwegian vessels diverted to the Atlantic, the Japanese in the near future are likely to have 95 per cent of the tonnage engaged in Oriental trade.

The Japanese, like the Norwegians, are not anxious to send their vessels to the Atlantic and the same pressure cannot be brought to bear as upon the Norwegians for reasons already stated. While the Japanese have promised to place some of their ships in the north Atlantic, the great bulk of their merchant marine will remain in the Pacific and continue to gather fabulous profits.

Japan is said to have on the ways 332,654 tons of steel vessels of over 3000 tons each which will soon be completed. England, France and Italy have

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been heavy buyers from the Japanese. Of the total 332,654 tons building, slightly more than 20 per cent will remain under the Japanese flag for Pacific trade. To be more exact, the vessels to be completed early in 1918, are to be disposed of as shown in Table I.

While the government maximum for time charters appears to be a heavy drop from 70s ($17.08), Oriental fixtures a year ago were being made at about 35s ($8.55). During part of 1916, the market had reached a level of 45s ($10.95) only to recede. While charterers were offering about 35s ($8.55) in early 1917, Norwegian owners of new vessels were asking 45s ($10.95) and during the spring of 1917, the latter figure was realized. During May, June and July, Oriental freights continued to rise until 60s ($14.60) was reached. As far as open records are concerned, it is known that one ship was fixed at the latter figure and there is no question that several Japanese steamers received a still higher rate. At the time the government interfered, the market was still soaring.

Approve Fixed Maximum

Charterers, as a rule, are glad that a maximum has been established and generally they consider 45s ($10.95) a fair figure. At this level, they claim owners can make very substantial profits, even under the greatly increased cost of operation and the greater investment involved. This is approximately $11 per deadweight ton per month and is in contrast with an average of $1 per ton, which similar tonnage brought prior to the war. When the government applied the brakes, many Americans were clamoring for Japanese ships, and were willing to pay the highest rates. In most cases, these exporters were not taking the chances apparent on the surface for they had full cargoes arranged at exceedingly attractive freights.

The transpacific situation is characterized by the continued scarcity of tonnage and the unprecedented movement of freight both to and from the Far East. The dangers incident to traffic through the Suez canal and North Atlantic have diverted many cargoes, which before the war went to Europe or to the American Atlantic. Seattle expects that much of this new trade will be permanent. This statement applies particularly to the imports of hemp, bean oil, rubber, gunnies and other Oriental commodities.

Aside from the general transpacific cargo trade, the lumber export market on this coast presents entirely different features and must be considered separately. This trade is handled now almost exclusively by American sailing vessels, or steam schooners of limited size. While the government has commandeered a number of American steamers and sailing vessels of more than 2500 tons, the smaller craft carrying lumber have been untouched.

With the charter of the Norwegian schooner J. W. CLISE to carry a cargo of lumber from Grays Harbor, Wash., to Valparaiso, Chile, in January, 1918, at $42 per thousand feet, net, Pacific Coast lumber freights have reached the highest levels yet touched. This figure is in marked contrast to many cargoes carried by the same vessel to Peru and Chile before the war at 37s 6d or approximately $9. To add to the profits of the coming voyage, the CLISE will return with nitrates from the west coast to Honolulu, whereas before the war no return freight was offering.

Three years ago, lumber freights to Sydney, New South Wales, and New Zealand were about 40s ($9.76) while today exporters are offering $45 for the same markets, and charters are firm and tonnage is scarce at this figure. Recent fixtures included five carriers chartered at $42.50 from North Pacific ports to Sydney or Newcastle, but since then the spot rate has advanced. The five schooners taken at $42.50 are to load in August, September and October, 1918, which indicates that some of the shrewd exporters do not anticipate any reduction in freights in the near future.

Freighters Get Return Cargoes

To Honolulu, spot ships are asking $22 for lumber, and coal is being shipped to the Islands at $12 per ton, free in and free out. To San Francisco, coal is paying from $3.50 to $4 per ton, free stevedoring, and from $4.50 to $5 to southern California.

In addition to these extraordinarily high freights for lumber, the carriers are being rapidly snapped up for return cargoes of copra from Manila and the South Seas, whereas before the war lumber vessels returned in ballast. An instance is cited where a schooner of 1000 tons, offered for sale at the abnormal price of $125,000, was offered cargo to South Africa and return via Australia, the voyage requiring about a year. This would have given the vessel a gross income of $143,000. Case oil, moving in large quantities from San Francisco to New Zealand, is carried at $1.50 per case, having advanced from 90 cents per case in the last six months. Copra in unlimited quantities is being offered from Manila at $75 per ton and from the South Pacific islands at $40 per ton.

That exporters can see no drop in freights is shown by the chartering recently of about 80 lumber carriers for 1918 and well into 1919 at current rates. From the exporter's viewpoint, the cost of freight is a mere incident. The shipper who can get his lumber into the foreign market can dispose of it, despite the cost of transportation.

Table II

Freight Rates from Puget Sound to Various Ports

Puget Sound to:	Jan. 1, 1918	Jan. 1, 1917	Jan. 1, 1916	Jan. 1, 1914
San Francisco	$6.50	$6.00	$5.00	$3.75
Southern California	7.50	7.00	5.50	4.50
Hawaiian ports	$20.00-22.00	17.50	9.50	5.75
New Zealand	42.50-45.00	120s	97s 6d-100s	40s 0d-42s 6d
Sydney, N. S. W.	42.50-45.00	120s	97s 6d-100s	40s 0d-42s 6d
Melbourne-Adelaide	45.00-47.50	132s 6d	110s	46s 3d-47s 6d
West Coast	42.50-45.00	$29.00	95s	47s 6d-55s 0d
South Africa	300s	250s	160s	67s 6d-70s 0d

Breaks 45-Year-Old Record

In considering present record rates for lumber to the West Coast and Australia, it is interesting to note the previous high level which history states took place in 1872-3. In the former year the highest freights paid were $37.50 to Callao and $34 to Melbourne while in 1873, ships received from $20 to $31 to Peruvian ports, $25 to $30 to Callao and from $25 to $33 to Melbourne. In those early days, the market fluctuated violently and did not have the sustained strength of the present period.

Domestic lumber freights are 50 cents less today than six months ago because there has been a lack of lumber owing to labor troubles in the summer months in camps and mills. However, freights to all foreign markets have advanced and the market is firm at going rates. Table II shows freights from Puget sound, per thousand feet.

Current freights on lumber to Shanghai and other Oriental ports range from $30 to $35 per thousand feet. The normal rate is from $8 to $10.

The year has been characterized by

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many sales of ships well known in the Pacific. Perhaps the most notable was the former Great Northern liner MINNESOTA, reported sold for $2,750,000. The AZTEC, sold for $750,000, and the HILONIAN, sold for $450,000 and turned over for a higher figure soon after. Both ships have since been lost in the war zones. While $175 per deadweight ton was the market price of modern tonnage early in the year, the price rapidly advanced to close to $300. Latest figures from Japan indicate that owners of new vessels were asking about $310 per deadweight ton but this figure has probably advanced to a much higher level.

Motor ships just completed or on the ways on this coast have sold for $125 per deadweight ton during the year and many of them have changed hands. Wooden steamers have been bought at from $150 per deadweight ton up. Steam schooners, built 12 or 15 years ago for about $75,000, have brought from $85,000 up. A wooden sailing schooner, of 500 deadweight tons, built 36 years ago, has just been sold for $30,000 while the steam schooner NORTHLAND has been sold for approximately $275,000.

Ships Bring Record Prices

This vessel is 817 tons net and three years ago could have been purchased for about $100,000. A small steel steamer, built in England 34 years ago, now under American registry, was recently sold for $150,000 but the purchasers failed to meet conditions. Since then the owners have indicated an unwillingness to sell but upon being pressed set $250,000 as their price. A wooden steamer, sold in the Orient, was taken for a lump sum said to be $47,500, to carry a full cargo from Seattle to Shanghai. Her capacity is about 2700 tons cargo, so that for the voyage across the charterers are paying approximately $18 per ton for space on this steamer.

Present indications are that the United States government will soon commandeer sailing ships of 500 tons gross and over. Should this be done it will assist in stabalizing freights and probably would bring down lumber rates as there is no foreign tonnage to compete for this business.

The entire charter situation is one of uncertainty. Government restrictions and regulations, scarcity of vessels, embargo and export rules, abnormal freights and the possibility of further federal interference, are some of the factors which owners, exporters and charterers are facing today. Notwithstanding the constantly increasing output of new ships, freights are likely to remain at high levels for an uncertain period. The situation in the Atlantic indirectly dominates the market on the Pacific coast.

Proposed Barges for New Waterway

(*Concluded from page* 71)

possibly half this depth into the compartment amidships.

It is estimated that with the steel barge loaded to a draught of 9 feet 6 inches, it will require 85.3 horsepower to propel it at a speed of 6 miles per hour through the canal, or to propel three barges at this speed will require 256 horsepower.

With these data as a basis, a suitable tug boat for this service should be of about the following principal dimensions: Length overall, 78 feet; length on keel, 69 feet; beam, molded, 20 feet; depth of hold, 9 feet 3 inches; draught, 7 feet 6 inches. From this it will be noted that the keel length of this boat is such that she can be turned or warped around in any part of the canal excepting the locks Furthermore, she will be equipped with coal-burning, watertube boilers, compound engines, with surface condenser, capable of developing 350 horsepower when driven to the full limit, so as to have a liberal margin for adverse condition of wind or foul bottoms on barges. These tugs are to be constructed of wood and furnished with salt water fittings, so that during the winter months, when not in use on the canal, they will be available for harbor work, as they will be satisfactory, serviceable craft for this purpose. Their equipment to be equal to the best modern practice for tugs of this type and size.

In studying this transportation problem, it is considered that the towing of these barges should be done in groups of three. A tug for seagoing and lake service should be approximately of the following general dimensions: Length overall, 170 feet; length between perpendiculars, 164 feet; beam extreme, 30 feet; depth at sides, 18 feet; load draught, 14 feet.

Engines and Boilers

The main engine is to be of the triple expansion type, capable of developing fully 1000 indicated horsepower when running at normal speed; boilers to be two in number. If the boilers are of the water tube type they should have a working pressure of 200 pounds, and if of the Scotch type they should be able to carry at least 170 pounds per square inch, by gage.

It is estimated that this tug under ordinary weather conditions will tow three of the 200-foot steel barges, each carrying 1600 tons deadweight cargo on a draught of 13 feet at a mean speed of 9 miles per hour, when developing 990 indicated horsepower.

To carry this same cargo of 4800 tons in one vessel, with her own propelling machinery, would require a craft of the following dimensons: Length, 350 feet; beam, 45 feet; draught, 18 feet. It would require 700 indicated horsepower to drive this vessel at a speed of 9 miles when loaded to an 18-foot draught.

From the foregoing it will be seen that if the load of three smaller vessels is placed in a larger vessel of equivalent increased dimension to carry such load, the horsepower required is only 70 per cent of that required for driving the three smaller vessels, but with the practical conditions of service, it will be found that while there is a saving in fuel by carrying the cargo in a single vessel, it will be more than offset by the cost of rehandling the cargo.

How Wooden Ships Are Built---IX

(*Concluded from page* 82)

down. Fig. 166 shows the method of spiking down the short lengths of plank between hatchways. Ten-inch galvanized boat spikes usually are employed. They may be driven with an air hammer instead of by hand.

Great care should be taken in laying the deck plank as it presents a very unsightly appearance when irregularly or carelessly put down. The edges should be fair, but not necessarily straight, as it sometimes is considered advisable to taper the strakes toward the bow in a curvilinear manner in order to neutralize the optical illusion of curved deck edges which is produced by parallel straight seams approaching a side of considerable curvature. In most American ships, the deck planks are straight and parallel. Whether straight or curved, it is absolutely necessary that the edges be fair. If the practice shown in Fig. 167 of laying several strakes together is followed very fair and even seams may be obtained.

The heads of the deck spikes are countersunk and the holes are filled with soft, white-pine plugs laid in white lead. The method of performing this operation is shown clearly in Fig. 179. After the spike heads are plugged, the deck is caulked. The preliminary caulking is performed by two men, as shown in Fig. 177. One holds the caulking iron and the other swings the maul. The final caulking is performed by one man who sits on a campstool and uses a light mallet. This operation is shown in Fig. 178. Fig. 176 shows the finished deck of a 5-masted wooden auxiliary schooner.

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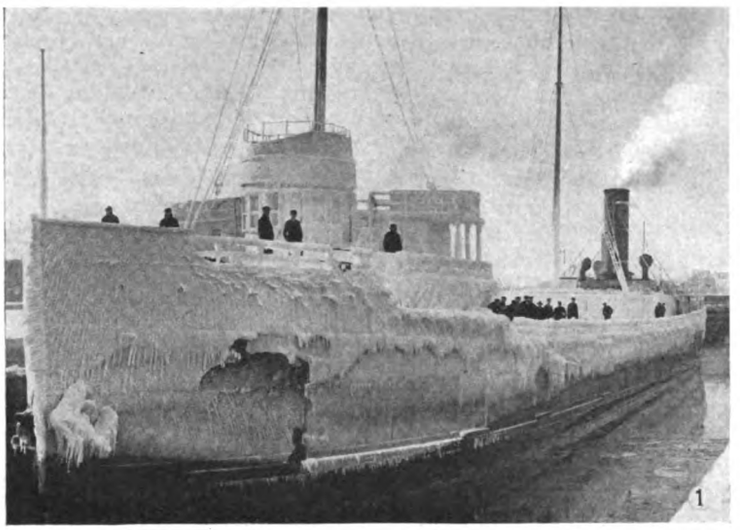

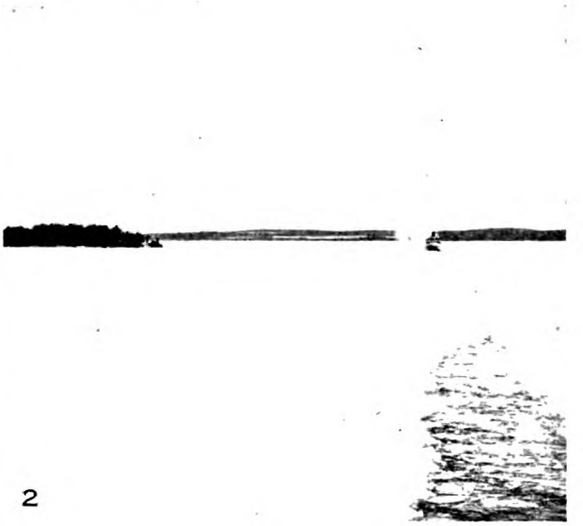

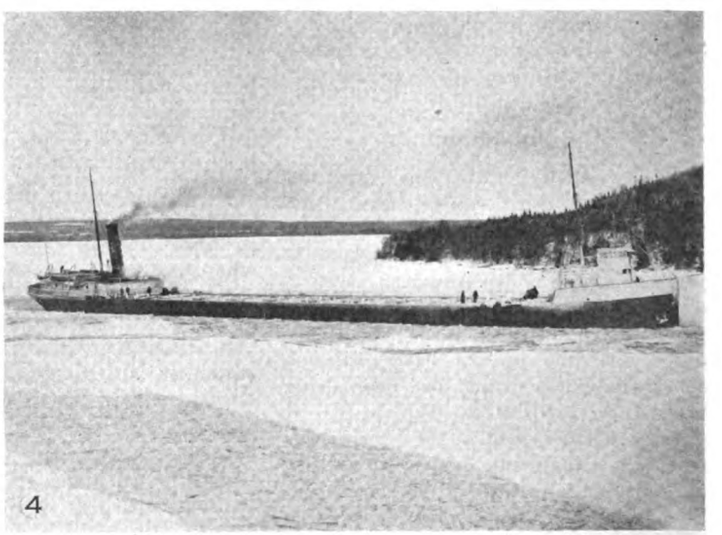

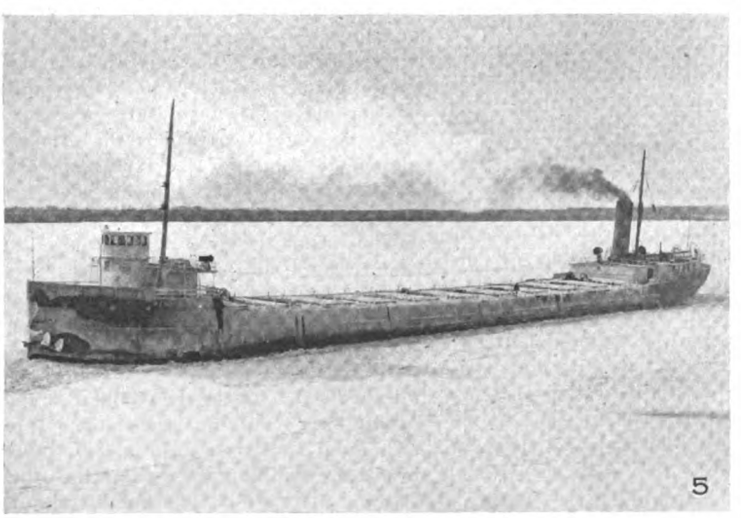

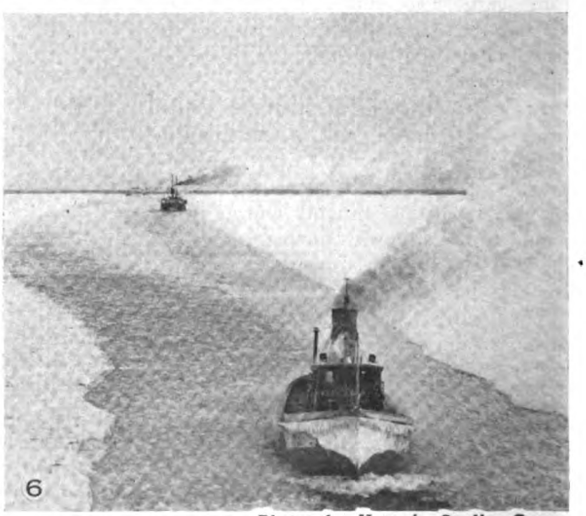

Photos by Young's Studio—Soo.

WINTER'S SUDDEN ARRIVAL IN DECEMBER FORMED ICE SO RAPIDLY ON THE GREAT LAKES THAT MANY VESSELS REACHED PORT ONLY AFTER ALL AVAILABLE TUGS AND ICE BREAKERS HAD BEEN PRESSED INTO SERVICE. THESE STEAMERS WERE MAKING LATE TRIPS IN ORDER TO MEET THE NATION'S NEEDS FOR GRAIN AND IRON ORE. THE VIEWS ABOVE SHOW HOW THE ICE-COVERED FREIGHTERS FOLLOWED CHANNELS BROKEN BY THE ICE CRUSHERS. (1) STEAMER WISSAHICKON IN SOO LOCK; (2) PASSENGER STEAMER HAMONIC FOLLOWING ICE CRUSHER; (3) STEAMERS FORCING WAY THROUGH ICE; (4) AMAZON BUCKING ICE; (5) MONROE C. SMITH, FOLLOWING ICE CRUSHER BUT ALREADY SURROUNDED BY NEW ICE; (6) TUGS MICHIGAN AND IOWA KEEPING CHANNEL OPEN; (7) CAPTAIN OF WISSA-

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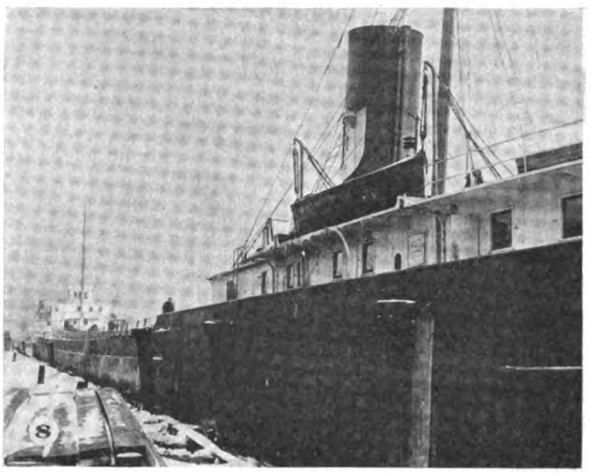
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HICKON IN WINTER NAVIGATION APPAREL; (8 AND 10) B. F. BERRY UNLOADING COAL AT DETROIT UNDER EMERGENCY ORDERS FROM FUEL ADMINISTRATION; (12) CARFERRY SAINTE MARIE WHICH WAGED A SUCCESSFUL FIGHT IN KEEPING OPEN THE CHANNEL BETWEEN LAKES SUPERIOR AND HURON. LAKE VESSELS IN THE ST. LAWRENCE RIVER ENROUTE TO THE ATLANTIC FOR WAR SERVICE WERE CAUGHT IN THE ICE. TUG KENTUCKY (9) TOOK THREE WEEKS TO REACH SOREL, 45 MILES BELOW MONTREAL, FROM SOUTH CHICAGO. (11) TUG SANDERS ACCOMPANIED KENTUCKY FROM ASHTABULA. BOTH TUGS ARE NOW LAID UP AT SOREL. SALT WATER CREWS WILL TAKE THEM DOWN IN THE SPRING

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Traffic on Great Lakes in 1917

Freight Movement Last Year Closely Approximated Record Total of Previous Twelve Months Despite Serious Delays Imposed by Ice

LAKE interests in 1917 moved an immense tonnage of bulk freight. Although the total movement falls short somewhat of the record-breaking figures of 1916, last year's showing was in many ways superior to the 1916 record. The fleet operated close to capacity despite the many obstacles which united to cause serious delays. Ice conditions, of course, were unusually severe at both the opening and closing of the year. Traffic congestion on the railroads retarded the quick unloading of the vessels at lower lake ports. The central control of the coal, grain and ore trades, which was put into effect during the middle of the season, aided the operators in securing the fullest possible use of their vessels. The accompanying tables furnish a complete record of the lake fleet's activities during 1917 and earlier years. The special insert presented with this issue shows how the lake fleet moved 96,700,000 gross tons of bulk freight in 1917, compared with 99,600,000 gross tons in 1916 and 79,400,000 gross tons in 1915. The complete report of the commerce passing through the Soo canal in 1917 shows that 22,885 vessels of 65,307,233 net tons registered, passed through these waterways in 1917. The total tonnage of freight locked through the American and Canadian canals was 89,813,898 short tons against 91,888,219 short tons in 1916, the decrease amounting to 2,074,321 short tons or 2 per cent. The complete report shows that the decreases in the iron ore and grain movement were largely offset by the increased shipments of coal. Iron ore shipments through the canals dropped from 63,452,107 short tons in 1916 to 61,374,090 short tons in 1917, a decline of 2,078,017 short tons or 3 per cent. Shipments of wheat fell off 18 per cent or from 226,063,315 bushels to 185,899,449 bushels. Shipments of grain decreased 28 per cent. The tonnage of soft coal handled through the canals last year was 15,736,654 short tons, an increase of 1,823,754 short tons over 1916 with 13,912,900 short tons. The increase amounted to 13 per cent. Hard coal shipments increased from 2,210,219 short tons in 1916 to 2,562,199 short tons in 1917, the gain amounting to 351,908 short

Great Lakes Traffic Statistics

COMMERCE THROUGH SOO CANAL

		Total traffic for Season of 1916	Season of 1917	Increase or decrease Amount	Per cent Inc.	Per cent Dec.
Vessels:						
Steamers	Number	21,606	19,569	2,037	..	9
Sailing	Number	2,461	1,943	518	..	21
Unregistered	Number	1,340	1,373	33	2	..
Total	Number	25,407	22,885	2,522	..	10
Lockages	Number	16,190	14,611	1,579	..	10
Tonnage:						
Registered	Net	69,824,463	65,307,233	4,517,230	..	6
Freight	Short	91,888,219	89,813,898	2,074,321	..	2
Passengers	Number	54,922	38,339	16,583	..	30
Flour	Barrels	10,239,841	8,450,039	1,789,802	..	17
Wheat	Bushels	226,063,315	185,899,449	40,163,866	..	18
Grain	Bushels	93,189,561	67,423,980	25,765,581	..	28
Copper	Short tons	126,043	118,812	7,231	..	6
*Iron ore.....	Short tons	63,452,107	61,374,090	2,078,017	..	3
Mfd. and pig iron...	Short tons	202,194	102,082	100,112	..	50
Coal:						
Hard	Short tons	2,210,219	2,562,199	351,980	16	..
Soft	Short tons	13,912,900	15,736,654	1,823,754	13	..
Lumber	M. ft. B. M.....	341,352	350,609	9,257	3	..
Salt	Barrels	729,840	569,956	159,884	..	22
General mdse.....	Short tons	1,649,020	1,491,714	157,306	..	10

*65,429 tons were westbound.

COAL MOVEMENT ON LAKES, NET TONS

Year	Soft Coal: Pittsburgh	Ohio	Virginia	Total*	Hard Coal	Total Coal Movement
1917.....	.....	.....	.....	26,502,620	4,689,983	31,192,603
1916.....	8,674,000	5,163,000	9,491,000	24,369,000	4,423,800	28,792,800
1915.....	10,100,000	2,620,000	8,750,000	22,420,000	3,800,000	26,220,000
1914.....	11,195,000	1,363,000	9,106,000	22,995,000	4,285,228	27,280,228
1913.....	13,415,473	6,176,624	8,736,586	28,328,683	5,033,696	33,362,379
1912.....	11,300,000	4,676,000	7,360,000	23,335,000	4,204,741	27,539,741
1911.....	10,611,941	4,019,544	7,151,200	21,782,685	3,917,419	25,700,104
1910.....	11,911,900	4,297,300	6,629,500	22,838,700	3,639,368	26,478,068
1909.....	8,687,395	3,002,815	3,874,570	15,564,690	3,052,706	18,617,396
1908.....	8,700,000	3,600,000	3,450,000	15,750,000	3,538,098	19,288,098
1907.....	10,549,995	4,074,296	3,420,941	18,037,232	3,449,695	21,486,927
1906.....	9,237,272	2,560,906	2,743,732	14,591,910	2,681,808	17,273,718
1905.....	7,443,883	2,062,692	2,109,262	11,615,837	2,785,362	14,401,199

*Includes fuel coal and also shipments from the Kentucky district and Pennsylvania districts other than Pittsburgh.

GRAIN TRADE OF THE GREAT LAKES

(Shipments of flour not included)

	1917	1916	1915	1914	1913
Lake Superior.....	253,315,244	319,252,876	320,236,805	218,622,167	317,051,875
Chicago	5,947,955	25,058,000	44,438,000	87,791,000	55,180,000
Milwaukee	1,924,385	3,188,280	4,324,428	10,857,683	11,867,798
Other ports	1,668,317	16,500,000	17,020,142	18,430,099	19,250,672
Totals, bushels..	262,855,601	363,999,156	386,019,375	337,718,949	403,360,346
Totals in net tons	7,161,716	10,555,975	11,194,562	9,793,850	11,697,160

CONTRACT FREIGHT RATES ON IRON ORE AND COAL

	Cents, 1917	Cents, 1916	Cents, 1915	Cents, 1914	Cents, 1913	Cents, 1912	Cents, 1911	Cents, 1910
Iron ore, head of Lake Superior to Ohio ports, gross ton....	100	50	40	50	55	50	60	**70**..
Iron ore, Marquette to Ohio ports, gross ton.....	90	45	35	45	50	45	55	**65**
Iron ore, Escanaba to Ohio ports, gross ton.....	75	35	25	35	40	35	**45**	**55**
Coal, Ohio ports to Lake Michigan ports, net ton.....	50–**75**	30	30	30	30	30	**30**	**35**
Coal, Ohio ports to Duluth, net ton.....	42.5–**50**	30	30	30	30	30	**30**	**35**

AVERAGE DAILY FREIGHT RATES ON GRAIN AND LUMBER

Wheat, Duluth to Buffalo, bushel.....	5.13	4.18	2.25	1.14	2.01	2.02	1.17	**1.33**
Wheat, Chicago to Buffalo, bushel.....	2.50	3.08	1.20	1.13	1.43	1.39	1.08	**1.44**
Lumber, head of lakes to Lake Erie ports.....	450	364	261	225	256	276	260	**234**

Black face type shows government fixed price.

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tons, or 16 per cent. The total coal movement was 31,192,603 net tons against 28,792,800 net tons in 1916. Last year's shipments included 26,502,620 net tons of soft coal and 4,689,983 net tons of hard coal. The total grain movement in 1916 was 262,855,601 bushels, or 7,161,716 net tons against 363,999,156 bushels, or 10,555,975 net tons in 1916. The tables show the complete record of the iron ore traffic in 1917. Total shipments from upper lake ports were 62,498,901 gross tons against 64,734,198 gross tons in 1916. Of this tonnage, Lake Erie ports received 48,812,859 gross tons and Lake Michigan ports, 12,118,747 gross tons. Lake Erie docks at the close of the navigation season held 10,326,349 gross tons. Shipments of iron ore from Lake Erie docks to furnaces from May 1 to Dec. 1 were 43,258,742 gross tons. The shipments from these docks between Dec. 1, 1916, and May 1, 1917, aggregated 5,395,528 gross tons, making total shipments of 48,654,270 gross tons from these docks to furnaces in the year ended Dec. 1, 1917, comparative figures are: 5,566,946 gross tons between Dec. 1, 1915, and May 1, 1916; 44,982,917 gross tons between May 1 and Dec. 1, 1916; 50,549,863 gross tons in the 12 months ended Dec. 1, 1916.

Furnace Shipments

ORE FORWARDED TO FURNACES FROM LAKE ERIE DOCKS MAY 1–DEC. 1

Year	Gross tons	Year	Gross tons
1917....	43,258,742	1914....	22,914,887
1916....	44,982,917	1913....	35,747,800
1915....	35,149,412	1912....	33,421,251

The number of bulk freighters on the Great Lakes on Jan. 1 of this year was 548, compared with 540 a year ago. During 1917, 11 large bulk freighters were launched, their carrying capacity aggregating 126,000 gross tons. Subtractions from the bulk freighter fleet last year were three vessels of 9822 gross tons carrying capacity. Thus the bulk freighter fleet at the opening of this year had a total carrying capacity in one trip of 3,225,763 gross tons against 3,109,585 gross tons on Jan. 1, 1917. The carrying capacity of the 11 new bulk freighters launched last year, in an average season of 20 trips, amounts to 2,520,000 gross tons. This compares with 1,640,000 tons of new capacity built in 1916; 200,000 tons in 1915; 1,220,000 tons in 1914; 560,000 tons in 1913; 990,000 tons in 1912; 1,100,000 tons in 1911; 3,890,000 tons in 1910 and 3,146,000 tons in 1909.

Iron Ore Traffic on Great Lakes in 1917

IRON ORE SHIPMENTS FROM UPPER LAKE PORTS, GROSS TONS

	1917	1916	1915	1914	1913	1912
Escanaba	7,156,854	7,457,444	5,649,289	3,664,451	5,399,444	5,234,655
Marquette	3,207,145	3,858,092	3,099,589	1,755,726	3,137,617	3,296,761
Ashland	7,597,841	8,057,814	5,146,772	3,363,419	4,338,230	4,797,101
Superior	13,978,741	12,787,046	8,342,793	11,309,748	13,788,343	14,240,714
Duluth	20,567,419	21,837,949	15,437,419	6,318,291	12,331,126	10,495,577
Two Harbors	9,990,901	10,735,853	8,642.942	5,610,262	10,075,718	9,370,969
Total	62,498,901	64,734,198	46,318,804	32,021,897	49,070,478	47,435,777

IRON ORE RECEIPTS AT LAKE ERIE PORTS, GROSS TONS

	1917	1916	1915	1914	1913	1912
Detroit	418,151	425,579	459,877	332,564	363,001	418,057
Toledo	2,445.602	2,035,160	1,158,374	773,711	1,084,215	1,411,278
Huron	1,631,395	1,324,112	695,865	617,363	687,485	540,586
Lorain	3,831,244	4,613,929	3,517,258	1,677,988	3,709,213	3,771,350
Cleveland	9,077,161	10,669,745	7,504,697	5,519,698	8,812.583	7,914,836
Fairport	2,311,179	2,580,647	2,001,103	1,558,134	2,037,126	1,801,381
Ashtabula	10,251,304	11,474,268	7,813,101	5,318,788	8,336.126	8,158,080
Conneaut	8,729,754	9,588,341	8,573,509	6,263,480	7,849,303	7,839,831
Erie	2,079,227	1,525,031	709,875	260,991	713,904	547,067
Buffalo	7,843,215	7,432,220	5,339,724	2,913,273	5,506,691	5,060,642
Port Colborne	194,627	138,240	196,077	166,665	.....	.....
Total	48,812,859	51,807,272	37,967,460	25,402,655	39,099,647	37,472,108

IRON ORE RECEIPTS AT LAKE MICHIGAN PORTS, GROSS TONS

	1917	1916	1915	1914	1913	1912
So. Chicago, Ill.	7,030,174	7,740.877	4,195,976	3,060,587	5,572,866	5,480,105
E. Jordan, Mich..	35,792	38,573	37,658	38,158	28,444	42,878
Boyne City, Mich.	44,437	43,788	40,401	50,098	45,028	45,000
Elk Rapids, Mich.	.....	.....	.....	28,437	.....	47,947
Milwaukee	224,570	239,219	187,286	93,121	234,591	138,065
Ind. Harbor, Ind.	900,692	793,215	689,226	661,054	455,252	514,748
Gary, Ind.	3,883,082	2,718,185	2,421,924	1,631,564	2,365,551	2,088,327
Total	12,118,747	11,573,857	7,572,471	6,109,019	8,701,732	8,357,070

IRON ORE ON LAKE ERIE DOCKS DEC. 1, GROSS TONS

	1917	1916	1915	1914	1913	1912
Toledo	399,479	394,869	311,799	580,600	349,047	552,016
Sandusky	.....	.....	1,871	2,471	2,472	2,472
Huron	556,765	590,743	558,692	433,769	441,541	385,810
Lorain	978,108	1,076,105	824,988	548,097	694,704	904,343
Cleveland	1,914,071	1,936,906	1,795,962	1,757,543	1,930,720	1,888,560
Fairport	536,580	474,930	413.994	406,124	478,014	565,920
Ashtabula	3,435,624	3,266,752	2,870,204	2,749,315	3,202,807	3,350,553
Conneaut	1,544.706	1,363,550	1,216,686	1,160,639	1,248,032	1,429,533
Erie	519,698	625,193	589,355	484,467	594,613	661,330
Buffalo	441,318	438,712	326,800	234,880	319,726	340,261
Total	10,326,349	10,167,760	8,910,351	8,407,905	9,261,676	10,080,798

Iron Ore Shipments in December

Port	1917	1916
Escanaba	155,984	177,545
Marquette	9,932	37,640
Ashland	94,362	122,629
Superior	209,308	160,573
Duluth	296,802	382,604
Two Harbors	145,087	204,909
Totals	911,475	1,085,900
1917 decrease	174,425	.....

Lake Erie Receipts in December

Ports	Tons
Buffalo	313,528
Erie	127,663
Conneaut	285,455
Ashtabula	278,192
Fairport	58,206
Cleveland	265,020
Lorain	127,429
Huron	19.643
Toledo	80,564
Detroit	65,970
Total	1,621,670

Size of Great Lakes Bulk Freighter Fleet

Year	No. of vessels Jan. 1	Launchings number	Subtractions, number	Carrying capacity, of new vessels, gross tons	Carrying capacity, subtracted, gross tons	Total carrying capacity, one trip, gross tons
1918	548	..	..	.....	.....	3,225,763
1917	540	11	3	126,000	9,822	3,109,585
1916	546	7	13	82,000	45,734	3,073,319
1915	546	1	1	10,000	3,104	3,066,423
1914	548	7	9	61,000	26,166	3,031,589
1913	572	4	28	28,000	120,919	3,124,508
1912	589	5	22	49,500	60.945	3,135,953
1911	592	5	8	55,000	29.477	3,108,330
1910	589	20	17	194,500	60,617	2,973,447
1909	587	17	5	157,300	37,197	2,853,344
1908	567	24	4	101,400	14,837	2.766,781
1907	542	40	16	368,000	46,973	2,442,754
1906	514	40	18	381,000	40,987	2,065,111
1905	518	29	33	260,200	114,374	1,919,285

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American Ship Yard Activities

A Snappy Summary of the Leading Events of the Month in the Vessel Construction Field

Urges Zone System for Shipyard Labor

AN article by Burton J. Hendrick in a recent issue of *World's Work* deals with the labor shortage which is so seriously hampering our shipbuilding program today. The author points out that the root of the trouble lies in the overnight growth of new shipyards in response to the government's demands for enormous tonnage in as short a period as possible. These concerns have in many cases built their plants in established shipbuilding districts, and instead of developing working forces of their own, they have used the offer of high wages to draw workmen from other plants. In this way they obviously add nothing to the shipbuilding industry, but are merely diffusing the facilities which already exist.

The very promiscuity which has characterized the awarding of vessel contracts has brought about intense competition for labor, and the resultant cut-throat wage offers are creating an unheard-of standard of living among working men. For instance, the average earning of a shipyard riveter is $90 a week, and other wages are proportionately high. However, the cause of the uneasiness in regard to labor is not the high wages demanded, but the fact that the men cannot be depended on. Thousands fail to appear after being hired; others work a few days and are enticed to another plant by an offer of more money. Then, too, beside being volatile, labor is proving itself, even in the present crisis, to be highly inflammable; strikes and time-wasting disputes are resulting wherever the spark of resistance to unreasonable demands is struck, and patriotism seems to make its appeal to loyalty only when accompanied by an increase in wages. The whole serious problem of shipbuilding concerns itself with this one variable factor—labor. Every contract for vessels has the clause "if we can get the workmen" written between its lines.

The one bright spot in the rather discouraging outlook is the fact that there are plenty of skilled workmen in the country. It is suggested that the thousands of able mechanics in the national army be transferred to the shipyards where they are sorely needed *now*. It is urged, further, that the federal government regulate employment and wages according to the zone system now under consideration. This plan provides for the designation of a number of geographical districts, each with its fixed scale of wages, determined by its own conditions. Under this system there should be no shifting of workmen from one concern to another, since wages would be uniform for all the plants in a district.

The shipping board has already taken steps to establish shipbuilding schools for workmen at large plants throughout the country. A selected force of skilled workers will study methods at one of the foremost shipyards—an "Industrial Plattsburg"—and will then be placed in charge of schools at other plants.

The building of these ships is as vitally important in the winning of this war as the manufacture of guns and ammunition. The government has already taken steps to fill the ranks in these industries and the solution of the present problem lies in rounding up the skilled mechanics of the country and impressing them into shipbuilding service at once.

Will Give Permission to Build Wood Ships

In a definite statement of policy the shipping board announced Dec. 20 that it would not discourage construction of wooden ships for private account, where their building would not interfere with the government program. Permission will continue to be refused for construction of steel cargo and passenger ships.

In granting permission for private construction of wooden ships, the board will give preference to American owners. Private building of barges and tugs will be encouraged in every way possible.

The building of new shipyards generally will not be encouraged. "The shipbuilding facilities of the country having been largely increased by the board within the last six months," says the announcement, "it will be the policy of the board hereafter to devote itself to the expansion of these new yards and the old yards, rather than to the creation of any further new yards unless it is found necessary to do so."

Canada Will Control Shipbuilding

Canada has adopted a definite plan for building ships under governmental control, according to C. C. Ballantyne, Canadian minister of marine. The Canadian government has decided to utilize the full capacity of Canadian shipyards in producing modern steel cargo steamers of the approved types. These vessels will sail under Canadian registry. The productive capacity of the Canadian shipyards is estimated at from 275,000 to 300,000 tons annually. During the continuance of the war, and for some time afterward, the construction of steel ships for foreign registry will not be permitted. The naval construction branch of the marine department is working out the details of the program which calls for the construction of three types of vessels; one of approximately 3000 tons which may be built in shipyards situated on the Great Lakes, another type of from 5000 to 7000 tons and a third with a deadweight capacity of from 8000 to 10,000 tons.

Owing to the difficulty of obtaining plates and shapes, it is stated that negotiations are under way to establish mills for rolling this material in sufficient quantities to meet maximum requirements.

The shipbuilding program will involve the expenditure of between $50,000,000 and $60,000,000 a year. Mr. Ballantyne has made public the following details of the government policy as recently determined upon:

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1.—The ships will be built and owned by the government. The policy inaugurated is one of government ownership of ocean transports.

2.—The ships will be operated, partially at least, by the government, although some may be chartered by responsible parties.

3.—No new shipyards will be established at present, but the existing shipyards will be utilized to their fullest capacity. The main yards are the Vickers, Montreal, Que.; George Davies, Levis, Que.; Polson Iron Works, Toronto; Collingwood Shipbuilding Co., Collingwood, Ont.; Port Arthur Drydock & Shipbuilding Co., Port Arthur, Ont., and the yards on the Pacific coast.

4.—Ships now under contract for the British government will be completed. These were let by the imperial munitions board. These ships will be finished early in the summer and after that time Canada will undertake all construction. It is felt that if Canada provides the finances she should exercise control.

5.—There will be an equitable distribution of labor between the various plants in order to secure the maximum efficiency.

6.—Charles Duguid, the government's naval architect, will be the technical officer in charge of the work. He has designed many modern vessels and has had several years of practical experience on the Clyde.

7.—Rolling mills to make plates will be located in Canada. Heretofore all steel of this kind has come from the United States, but in order to meet this program, mills will be located in connection with the plants at Sydney and New Glasgow, N. S., and Hamilton and Sault Ste. Marie, Ont.

The Southern Pine association has organized a corps of speakers to send out to mill towns throughout the South. The speakers will make direct appeals to the men who are employed in the mills and logging camps to do their full duty at this time when ships are needed so badly. Emphasis will be placed upon the fact that fighting men must be fed and that every day's delay in getting out ship timbers will mean a greater delay in bringing the war to a close.

Latest News from American Shipyards

The Puget Sound Bridge & Dredging Co. at its Seattle, Wash., plant recently launched a 2500-ton auxiliary schooner. This vessel is for the French government and was christened DIXMUDE. She is the seventh 2500-ton wooden vessel launched at this plant since the first of 1917. All of the vessels are of the same type and design.

* * *

The Erickson Engineering Co., shipbuilder, Seattle, has made application for a permit to erect another building. This permit is for a 2-story frame building to be used as a mold loft. The building, which is the third one to be erected by the company, is to be 360 x 80 feet and will cost $20,000.

* * *

The Pacific Coast Shipbuilding Co., San Francisco, intends to begin work in March on the construction of ten 9400-ton steel steamships for the Emergency Fleet corporation. The work will be done at the Suisun bay plant near Bay Point. According to John T. Scott, superintendent, after the work is well under way, a vessel will be launched every month beginning with the first launching in October.

* * *

The Grays Harbor Motorship Corp., Aberdeen, Wash., recently launched one of the largest wooden steamships ever built. Her dimensions are: Length over all 290 feet, beam 49 feet, draft 26 feet 6 inches. The contract calls for a speed of 10 knots. This is the first wooden ship to be launched for the United States shipping board.

* * *

E. B. Deming, president of the Pacific American Fisheries, recently announced that the company's South Bellingham, Wash., shipyard would construct vessels for the United States government. The keel of one government vessel has already been laid and the construction of two more ships will begin within a short time. Five vessels, each 281 feet long, will be under construction at the same time shortly after the first of the year.

* * *

According to the United States shipping board, the Meacham & Babcock Shipbuilding Co., Seattle, is setting a swift pace for speed in constructing wooden ships. The board makes special mention of the fact that keels for two government ships were laid 10 days after the contract was closed.

* * *

Everett, Wash., is to have a $1,000,000 shipyard and drydock according to an advice from that city. The yard is to be equipped to build both steel and wooden vessels while the drydock will be capable of handling 4800 tons deadweight. The yard is to be built by the Norway-Pacific Construction & Dry Dock Co., Seattle, of which M. G. Thomle is president. The company will require a working force of 3500 men and plans to construct five ships at one time.

* * *

The Gig Harbor Island plant of J. F. Duthie & Co. has launched its third large vessel since Sept. 1. The last ship to go down the ways was the steel steamship WAR GENERAL, a vessel of 8800 tons. The WAR GENERAL was ordered by the Cunard Line of England but has been commandeered by the United States shipping board. Two other 8800-ton ships, the WAR LEOPARD and the HALLBJORG, had been launched previously.

* * *

Norwegian interests have placed contracts for four more wooden ships with Puget sound yards. Two of the vessels will be constructed by the Martinolich Shipbuilding Co., which is now building a plant at Dockton, Vashon island. The other two ships will be built by the McAteer Shipbuilding Co., Seattle. The vessels are to be 250 feet over all, beam 44 feet. The McAteer company, of which John McAteer is president, has three ships under construction. The Martinolich company has contracts for building three ships.

The McAteer Shipbuilding Co., Seattle, is installing approximately $40,000 worth of new machinery in order to handle its new shipbuilding contracts as rapidly as possible. To offset the labor shortage, which is a serious factor on the Pacific coast, the company is installing all of the equipment it can secure to increase its capacity and expedite construction work.

* * *

The Toronto harbor commissioners have started to build a shipbuilding plant for the Dominion Shipbuilding Co., Ltd. The company has leased for a term of 21 years 15 acres of reclaimed land where its $2,000,000 plant is being erected. The plant will consist of a number of buildings, the largest of which will be 800 x 100 feet. Five berths are to be provided, each capable of taking ships up to 261 feet in length with 43-foot beam. The company is understood to be seeking government contracts for ocean going vessels. While awaiting these, however, it will build six steel freighters of the "Friedrichstadt" type. These will be somewhat similar to the standard type of vessels now being turned out in large numbers for the imperial munitions board. Each vessel will have a deadweight capacity of 3500 tons. From 1500 to 2000 men will be employed. The company intends to continue in the shipbuilding business after the close of the war. L. Dahlgren, Toronto, will be vice president and general manager.

* * *

The United States Shipbuilding Corp. has begun work on its new shipyard at San Diego, Cal. The plant is to be modern in every respect and is to cost $1,500,000. Piledrivers and barge loads of material were warped down to the 32-acre site of the new plant recently and the initial work of driving piles for the 4000-foot bulkhead is well under way. Later, the foundation piles for the shops and slips will be driven. The new plant will give employment to approximately 3000 men. Benjamin F. Graham is president.

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On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Lake Shipyards Rushed With Work

BY M. L. HADDEN

THE George Hall Coal Transportation Co., Ogdensburg, N. Y., has purchased the business of the Frontier Trading Co., Ogdensburg, and the Canada Shipping Co., Montreal, Que. This gives the Hall company an extra fleet of 16 vessels which will be placed in the coal and wood pulp trade between points on Lake Ontario and the St. Lawrence river. Four vessels owned by the company have been commandeered recently by the government.

* * *

The schooner BELLE BROWN caused a part of the city of Port Huron, Mich., to be plunged into darkness recently. While passing up Black river in tow of a tug she caught her spars among the electric light wires extending across the river, breaking them and completely cutting off the light from the north side of the city. Power was also cut off from this district, preventing the swinging of the military bridge causing a tie-up of traffic until repairs were made some hours later.

* * *

The death of Capt. A. C. May occurred Dec. 13 at Port Huron, Mich. Captain May had been in command of the steamer JAMES J. HILL until early this season when failing health forced him to retire. He was master of the steamer H. B. HAWGOOD during the blizzard of November, 1913, and when he lost his bearings in a blinding snowstorm, decided to beach the steamer, which he did near Point Edward. This proved a fortunate move, as the steamer was not damaged and was easily floated. On this occasion Captain May was commended by the owners of his ship for his foresight. He had commanded boats owned by Whitney interests and the Pittsburgh Steamship Co., as well as the Hawgood line.

* * *

The sand sucker DESMOND was blown out of her course while bound recently from Benton Harbor, Mich., to Racine, Wis., and drifted toward South Chicago, where she rolled over, drowning seven of her crew. Capt. Emil Thorensen was among those lost. Rescue parties from South Chicago tried to reach the vessel but were unable to find her on account of a heavy fog. Later the six remaining members of her crew were picked up. The DESMOND was a wooden steamer, 149 feet long and 30 feet beam. She was operated in the sand trade by the Cream City Sand & Gravel Co., Milwaukee.

* * *

Frank S. Masten, of the law firm of Holding, Masten, Duncan & Leckie, Cleveland, died suddenly at Toronto, Ont., Jan. 4. For years Mr. Masten had been prominent in the lake trade, where his clear knowledge of marine law and marine insurance had been generally recognized.

* * *

Three American lake freighters are held up for the winter because of the ice formation in the Lachine canal. Two tugs which were endeavoring to keep the channel open for the freighters coming down are also fast in the ice and all five vessels will winter there.

* * *

A small barge named LITTLETON OF BARAGA ran aground recently near Marquette, Mich. C. L. Nelson and M. More, Au Train, inspected the vessel but could find no trace of human beings. The boat was loaded with apples, which had apparently been frozen for some time. The lifeboat was gone but two life preservers were on deck. It is believed the crew abandoned the barge in a high wind, first letting go an anchor, and that the drifting vessel broke her cable and grounded on the beach.

* * *

The tug H. A. MELDRUM, owned by the Great Lakes Dredge & Dock Co., Buffalo, sank while crushing ice in the Buffalo river, Jan. 4. A hole was stove in her bow by a chunk of ice and she sank in five minutes, endangering the lives of her crew, who were picked up later on an ice flow. Capt. John Jones was in charge.

* * *

The steamer LEHIGH, bound from Cleveland to the coast with a cargo of coal, damaged her bow and sank in the Welland canal near Welland. On account of the time consumed in making repairs, she was unable to reach the coast, ice having formed in the St. Lawrence river. The LEHIGH was formerly owned by the Harvey-Morrison Co., Cleveland, who sold her to Cuban interests recently.

* * *

The Insurance Co. of North America presented Capt. Alex Cunning, wrecking master for the Great Lakes Towing Co., with a check for $500 in recognition of his services in salving the steamer WESTERN STAR, which struck a shoal and sank in Georgian bay in September, 1915. The ship was regarded as a total loss and was abandoned to the underwriters, who paid her owners' claims and then attempted to salve her. This extremely difficult work was done successfully under Captain Cunning's direction, as described in THE MARINE REVIEW, December, 1917.

* * *

The first of 20 freighters being built at the Lorain, O., yards of the American Shipbuilding Co. for the United States shipping board was launched Dec. 20 without ceremony. The vessel was christened WAR WREN. She is 261 feet long and 43 feet beam.

* * *

The old lake steamer TUSCARORA, which was sent to the coast, was lost with all hands off the coast of Newfoundland. The steamer, was was formerly owned by the Lehigh Valley Transportation Co., Buffalo, was taken over by the United States shipping board in September; she was cut in two at Buffalo and taken to Montreal in sections. The TUSCARORA was built in Cleveland in 1890. She was 291 feet

Lake News in Verse

A SUBSCRIBER who confesses that he finds the monthly Great Lakes Notes of much interest, suggests that they be published occasionally in verse. He sends the following to illustrate his idea:

The steamer CHARLEY JOHNSON
Near Ecorse hit a rock;
The lookout was awakened
Very rudely by the shock.

* * *

The government has taken
The tugboat HENRY YOST,
Will fit her for salt water
And send her to the coast.

* * *

The lighter JOHN H. WILSON
Hit the barge MELINDA SAL,
And smashed her something awful
In the dear old Soo canal.

* * *

The mudscow ANNIE LAURIE
Last Wednesday lost a plank;
The fishing tug JESS WILLARD
Struck Cedar Point and sank.

* * *

The ship GOLD BOND *of Cleveland*
Went down near Rocky Shoals;
Her knitting needle cargo
Had stove her full of holes.

* * *

The shipyards near Goat Island,
If all reports are true,
Will launch a rowboat soon,
Then lay keel for a canoe.

* * *

At Conneaut the SHE-AND-HE
Is laid up for repair;
Off Put-in-Bay she struck a rock
She didn't know was there.

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long and 40 feet beam. She carried a crew of 35 men, recruited mainly from New England.

* * *

Capt. Hubert G. Haybarger, master of the steamer F. L. ROBBINS, will take charge of the free government navigation school which has been opened at the Case School of Applied Science, Cleveland. Captain Haybarger will remain in charge of the school during the closed season of navigation.

* * *

The steamer OGONTZ is being rebuilt by Charles Roe & Co., Harbor Springs, Mich. The vessel has been laying at the dock for some time, having been dismantled last spring. She will be operated as a ferry after being rebuilt.

* * *

The steamer WAR FERRET, built for salt water service, was launched Dec. 29 at the Detroit yard of the American Shipbuilding Co. The WAR FERRET is Welland canal size and will leave for the coast at the opening of navigation in the spring.

* * *

The whaleback steamer HENRY CORT, owned by the Pittsburgh Steamship Co., which was sunk in a collision with the steamer MIDVALE, near Bar Point, Lake Erie, will probably be raised this spring.

Along the Atlantic and Gulf Coasts

IMMIGRATION Commissioner H. J. Skeffington has been assured by Secretary Wilson, of the department of labor, that steps are to be taken to provide a new immigration station for the port of Boston to replace the unsatisfactory quarters on Long wharf. Twelve years ago an agitation for a new station was started and a site in East Boston was purchased, but the sum appropriated for the structure fell far short of requirements.

* * *

Boston harbor was so icebound early in January that old-timers among shipping men could recall no parallel. None but high-powered steamers were able to force a passage through the barrier which extended as far as the eye could discern. The sheet of crystal was ribboned with leads which closed under force of wind and tide. Ferries were so hampered that railroads were not maintaining schedules. Cargoes of coal could not be placed alongside piers because of the ice blockade and tugs with loaded barges were stalled for considerable periods at the western entrance of the Cape Cod canal and in Vineyard and Nantucket sounds.

* * *

Two more large steamers of the Eastern Steamship Lines, Inc., the GOVERNOR DINGLEY and the CALVIN AUSTIN, have been taken over by the government for use in training seamen for the new merchant marine. The ships have been berthed at East Boston and will accommodate classes of 500 each. On Jan. 1 recruits were being sent to the AUSTIN, where they are to be drilled in classes of 10 by practical instructors. Henry Howard, director of recruiting, with headquarters at Boston, expects to have at least 50,000 men grounded in rudiments of "sailoring" within the next 12 months, as more training schools are to be opened as quickly as suitable vessels are available. It is Mr. Howard's purpose to send the training ships on cruises to give the students practical instruction.

* * *

Word confirming loss of the Boston 3-masted schooner COLIN C. BAKER one of the best known coasters of New England, has been received. The vessel, commanded by Captain Chaves, foundered while bound from an Atlantic port to Cape de Verde islands.

* * *

All hope has been abandoned for the safety of Capt. Richard Lee, his wife and crew of 18 of the Boston sailing ship TIMANDRA, which left an Atlantic port for Buenos Aires with a cargo of coal March 6 of last year. In marine circles it is hinted that the big iron craft was destroyed by time bombs. Captain Lee's home was in Yarmouth, N. S.

* * *

A fleet of ships and barks is reaching Boston from the Far East and Africa with cargoes sorely needed by importers. Wool receipts are not far below normal because of the assistance rendered by sail craft in absence of steam tonnage.

* * *

Three steam trawlers for the Bay State Fishing Co., Boston, while bound from the lakes to the coast have been frozen in. These vessels were expected to materially relieve the shortage of sea food which is becoming acute at the principal market centers.

* * *

The Cunard line recently gave all of its employes at Boston a bonus of 10 per cent of their wages, this being the second bonus of the same amount for 1917.

* * *

Fire badly damaged the gas producer tug B. G. PURDY, only vessel of the type in Boston waters.

* * *

The British schooner ST. BERNARD, familiar in shipping circles along the New England coast, was destroyed in the recent explosion at Halifax, N. S. All hands on board were killed.

* * *

Among recent sales by the Boston Ship Brokerage Co. is that of the 40-year-old, 3-mast schooner F. H. ODIORNE to New Orleans interests for $20,000. The vessel is of 307 net tons register and will be placed in the gulf trade.

* * *

The gulf foreign freight committee, with more than 150 representatives from all parts of the south in attendance, met in New Orleans, Jan. 8. E. V. Boyd, head of the organization, presided. The use of inland waterways and shipping on them as a means of relieving freight congestion on railroads handling traffic into and out of gulf ports was discussed.

* * *

Men at sea to whom questionnaires have been mailed by local exemption boards in the ports of the south have been granted additional time in which to file their answers. This affects nearly 1000 men in New Orleans and probably 2500 more in other gulf ports.

* * *

The Public Belt railroad, which girdles the city of New Orleans and connects every wharf and waterfront warehouse with the railroads entering the port, has decided to expend $115,000 immediately in extending its tracks and bettering its service by connecting the wharves with a number of inland warehouses.

* * *

Sam. W. Weis has been re-elected head of the traffic and transportation bureau of the New Orleans association of commerce.

* * *

A training station for the United States shipping board, with a training ship on Lake Ponchartrain, is to be established at an early date, according to Ernest Lee Jahncke, who is in charge of the work of the gulf division of the shipping board. The date of opening of the training station, according to Mr. Jahncke, depends on the readiness with which the men of the gulf coast respond to the call for men for the merchant marine.

* * *

The United States Steel Corp. has placed orders for 50,000,000 feet of lumber for the construction of houses for workmen at its new shipyard at Mobile, Ala.

* * *

Cost of bunker coal at shipside in New Orleans harbor has been reduced nearly $1 a ton by the action of John G. O'Kelley, state fuel administrator, in compelling dealers to make complete reports of cost of coal, handling expenses and selling price.

* * *

M. J. Sanders, of the Leyland line, W. P. Ross and W. F. Cunningham, all of New Orleans, held a conference recently with the federal shipping board relative to developing a line of about 20 barges on the lower Mississippi river, with government aid, to help relieve railroad congestion. The idea of the barge line had its inception at a meeting of business men of Memphis, St. Louis and New Orleans, in St. Louis, Dec. 17 and 18, to consider the revival of river traffic by means of barges and tugs, the main object being to bring coal from the north and send back sugar, rice and coffee.

* * *

The International Shipbuilding Co., incorporated by Henry Piaggio, called the father of wooden shipbuilding on the gulf coast, has begun to enlarge its already large yard at Pascagoula, Miss. The company recently bought a strip running 1800 feet along the East Pascagoula river, by 1100 feet deep, giving it control of 3400 feet on the river, with an average depth of 1200 feet, or approximately 120 acres. The company began clearing the new

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tract Dec. 15, and on Jan. 1 started work on a new contract for 14 steel ships, ranging from 6500 to 9500 tons. The work, according to those in charge of the plant, will require the services of 3000 men for more than two years. The same company now has under construction or waiting room on the ways 12 wooden ships of 3600 tons each. The International has erected a 2-story building, the basement of which is being fitted for constructing small motor boats, dories and yawls. The company has erected a 50-room hotel and is building several blocks of cottages for married employes. An order has been placed with Mississippi lumber firms for 1,600,000 feet of lumber.

* * *

The enormous increase in shipbuilding on the gulf coast has been of great benefit to every city from Galveston to Tampa. The population of Biloxi, Miss., has increased between 15 and 20 per cent as a result of the establishment of shipyards there; Pascagoula reports an increase of 25 per cent; Moss Point has nearly doubled in population, and Mobile tells of a gain of 10 per cent. Pensacola also has grown. Large payrolls at all of these shipyards also have meant much for the prosperity of these towns.

* * *

Twenty-eight wooden vessels—mostly auxiliaries, to be fitted with diesel engines—are under contract or being constructed in the yards at Pascagoula.

* * *

Capt. Harvey P. McNeeley, one of the oldest and best known harbor pilots of New Orleans, died at his home in Algiers, La., early in December. He was 72 years old, and death was directly due to a stroke of paralysis suffered late in November.

* * *

Ship charters, either foreign or American, will be void unless approved by the chartering committee of the United States shipping board, according to notice received by the association of commerce at New Orleans. Such charters, says the warning, must be filed with the committee at room 409 customhouse, New York. Unless the charters are approved by the committee, the ships involved will be unable to get bunker coal or ship supplies at any port in the United States.

* * *

Capt. Varian Scott, who has a shipyard in Mobile, has laid the keel for a 500-ton, 3-mast auxiliary, to be launched in February.

Up and Down the Pacific Coast

PUGET sound shipbuilding scored another record when the Seattle Construction & Dry Dock Co., on Dec. 19, launched the steel steamship WALTER A. LUCKENBACH. This vessel is the largest merchant steamship ever built in the Pacific northwest. The WALTER A. LUCKENBACH registers 12,000 tons deadweight and fully loaded will displace 17,000 tons. The battleship NEBRASKA, built by the same yards, is the only other craft constructed on Puget sound larger than the WALTER A. LUCKENBACH.

The sponsor of the new vessel was Mrs. C. W. Wiley, wife of the president of the company. She was attended by Mrs. H. W. Kent, Mrs. J. E. Sheedy and Mrs. E. K. Worthington, wives of officials of the plant. In memory of the occasion, Mrs. Wiley was presented with a beautiful diamond inlaid lavelliere, the gift of the William H. Todd Shipbuilding Co., New York.

The WALTER A. LUCKENBACH was ordered by the Luckenbach Steamship Co., New York, for delivery in January. However, she was among the hulls commandeered by the United States shipping board and she is being completed by the Emergency Fleet corporation. It is expected that the name will be changed in accordance with the government's program. On the company's books, the vessel is known as hull No. 91.

The new vessel is of a distinctive type with a cruiser stern. The dimensions are: Length, 470 feet; beam, 55 feet 11 inches; depth, molded, 40 feet 8 inches. She is to have a speed of 14 knots, rendering her among the fastest cargo carriers under the American flag. Four water-tube boilers will furnish the power for geared turbine engines. The ship will have twin screws. She will be ready in service in January.

* * *

On Dec. 12, the Washington Shipping Corp., Seattle, sent its seventh auxiliary wooden ship, the DIXMUDE, into the waters of Elliott bay. She was christened by Mrs. Kenneth M. Walker, wife of the representative of the Bureau Veritas under whose classification the vessel was built. The DIXMUDE is 250 feet in length and has a deadweight capacity of 2600 tons, similar to her sister ships from the same yards. With the BARLEOUX and DOUAUMONT, the DIXMUDE has been built for French interests and like her sister vessels, she was launched practically complete in every respect. The first four wooden vessels built by this yard were contracted for by Norwegian owners and they are now in service.

* * *

The Seattle Construction & Dry Dock Co. has already laid the keels for the first of the ten 7500-ton steel steamships ordered direct by the shipping board. During the year this yard has done an immense amount of ship repair work, including that on several of the interned German vessels which required extensive repairs. Good progress is being made in rehabilitating the steamship NANKING, formerly the CONGRESS, of the Pacific Coast Steamship Co.'s fleet, which was almost destroyed by fire off the Pacific coast in September, 1916. The NANKING will be used on the Pacific by the Pacific Mail Steamship Co., which bought the damaged vessel.

* * *

The Skinner-Eddy corporation closed a splendid year with two launchings, making 11 for 1917 and a total of 13 since the yard began work in the fall of 1916. The 10,000-ton tank steamship TRONTOLITE went into the water Dec. 15 and the 8800-ton ABSAROKA was launched Dec. 22. The TRONTOLITE is a sister vessel of the Standard Oil tankers S. V. HARKNESS and JOSIAH MACEY, turned out during the year. Both the TRONTOLITE and the ABSAROKA are for the shipping board, the latter vessel being the third steel cargo steamship built to the order of the Emergency Fleet corporation. With the launching of the ABSAROKA, the Skinner-Eddy yard claims the lead of all plants in the United States for 1917, having placed a total of 100,400 tons deadweight in the water during the year.

* * *

The plant of J. F. Duthie & Co. celebrated its third launching, Dec. 8, when the 8800-ton steel steamship WAR GENERAL went down the ways, christened by Miss Carolyn Blain, daughter of Capt. J. F. Blain, northwest representative of the shipping board. The WAR GENERAL is a standard type and was ordered for the Cunard line. She was commandeered while on the ways and since has been named WESTFIELD and will shortly be ready for service.

* * *

Commandeering of the powerful seagoing tug GOLIAH by the United States navy will greatly handicap Alaska commerce out of Puget sound. For the past several years, the GOLIAH has made several notable tows, principally from Seattle to southwestern Alaskan ports. This vessel has a steaming radius of nearly 3000 miles and was the only tug of her class operated out of Seattle. Several of the canneries and whaling stations in northern waters have depended on the GOLIAH to handle their barges which supply the stations. With the big tug gone, these stations declare they will be seriously handicapped. The GOLIAH in November, 1916, achieved a notable feat when she salved the disabled Norwegian steamer NIELS NIELSEN which was helpless off the Vancouver island shore. It is admitted that the GOLIAH's timely assistance saved the valuable cargo carrier. Since then the GOLIAH registered another record. From Seattle she towed a barge to Akutan, Alaska, then proceeded to Honolulu and returned to Puget sound towing an interned German steamer. It is understood that the GOLIAH is to be used in Atlantic towing where she is urgently needed, but in the meantime, with no other tugs of this class available, Alaska operators are bemoaning their loss.

* * *

Hull No. 92, launched at the Seattle Construction & Dry Dock Co., Nov. 21, has been named SACRAENTO by the United States shipping board, by whom she was commandeered. This vessel of 7500-ton cargo capacity type, was originally ordered by Norwegian owners and is a sister vessel to the STORVIKEN, GOLDEN GATE and KEY WEST, also launched this year and now in service on the Pacific under the Norwegian flag.

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Red Hot Tips From the Trade

Pertinent Suggestions and Personal Gossip

THE necessity of conserving the country's resources is one lesson which the war has already driven home. As a result of the serious fuel shortage, shipowners are realizing more keenly that enormous quantities of coal are being needlessly consumed every year because modern fireroom equipment is not employed more generally. Some of the equipment used has been aptly described by one government engineer as the "type used by Noah when a boy". Such equipment curtails the efficiency of the boilers and frequently cuts down the speed of the vessel. The result is that large tonnages of coal are wasted and man power unnecessarily expended.

Only a short time ago, the necessity for conservation was not so evident. Coal was plentiful and cheap, men were begging for jobs and the lack of business made speed a secondary consideration. Present conditions, however, demand fuel saving by the entire industrial world. Equipment and methods which will insure the highest possible utilization of every pound of coal must be adopted.

Many firemen were taught to fire and operate a furnace by old methods, using old-style equipment. Many engineers have failed to suggest the installation of modern and efficient methods. Many shipowners are more familiar with financing than with fire and engineroom problems.

Serious consideration must now be given to these problems. Grate bars and firing methods are prominent factors in deciding whether fuel economy or waste, boiler efficiency or inefficiency, is secured. Particular attention has been given to this problem by the Thomas Grate Bar Co., Birmingham, Ala.

This company manufactures grate bars of the elliptic type for use on steamships. It is said that these grate bars are so designed that they are positive in operation at all times. They are said to effect a large saving in fuel. They eliminate the cleaning period. Fireroom methods have been analyzed by the Thomas company, and the results are being distributed upon request.

N. B. Payne has established an office in the Havermeyer building, 25 Church street, New York, and will specialize in supplying to the trade new and used traveling cranes. Mr. Payne formerly was associated with Manning, Maxwell & Moore, Inc., New York, and has had a wide experience in this line of work.

Metallic Packing

The uses of metallic packing in various installations on land and sea are set forth in a 15-page booklet issued by the Cassco Bar-Metallic Packing Co., Chicago. This company's packing is composed of an antifriction metal, graphite and a solid lubricant all formed as one unit under heavy pressure. This packing is said to be frictionless and noncorrosive as well as self-lubricating.

It has been used on some of the largest vessels afloat, including the LEVIATHAN, formerly the VATERLAND, and on the government vessels HAMBURG, PRESIDENT GRANT, CYTHERIA, KOENIG WILHELM II, GROSSER KURFURST and the MARTHA WASHINGTON.

On the Great Lakes this packing has been used on vessels of the Goodrich Transit Co., Pittsburgh Steamship Co., Great Lakes Transit Co., R. P. Wilson Transit Co., W. C. Richardson & Co., and on the ships of several other lines.

The booklet describes the packing fully and gives complete directions for its use.

Marine Supplies

The George B. Carpenter Co., Chicago, has just issued a 430-page catalog of marine hardware and ship supplies. This catalog contains considerable information regarding marine fittings of all kinds. Sections are devoted to power boat laws, the installation and operation of modern marine gasoline engines and practical sailing lessons.

Steam Motors

The Steam Motors Co., Springfield, Mass., has issued an attractive booklet describing its prime mover of the mechanical drive turbine type. This motor is said to be particularly adapted for driving generators, blowers, stokers, fans and centrifugal pumps and is adapted for both land and sea service.

The motor operates on the straight, velocity stage, impulse principle. It is furnished in sizes from 5 to 250 horsepower. It is constructed with a single bearing only, and when connected to the driven apparatus it automatically becomes an integral part of the overall equipment, making a two-bearing outfit.

Many illustrations are included in the booklet and the specifications describing the apparatus are concise and complete.

Marine Glue

A folder containing information on marine glue and its practical application has been issued by L. W. Ferdinand & Co., Boston. The glue described is supplied in several varieties adapted respectively for deck and hull seams, for backing armor plates, for coating the interior of battery boxes, for covering boats and decks with canvas, for waterproofing packing cases and tanks for ammonia pipes and general purposes, and for making hollow spars. The pamphlet describes in detail the different methods of using the glue.

Building Many Ships

Director George T. Webster, of the department of wharves, docks and ferries, Philadelphia, predicts that shipyards along the Delaware river will soon be turning out a 9000-ton ship daily, provided the present rate of shipbuilding construction is maintained. Mr. Webster points out that shipbuilders predict that there will soon be 120 ways on the Delaware, each capable of turning out one ship every four months.

Valves and Fittings

The Crane Co., Chicago, has issued a complete catalog describing the company's valves and fittings for all pressures and purposes. The book is of a convenient size, 4 x 6½ inches, and contains 775 pages of descriptive matter. The catalog is profusely illustrated, most of the illustrations being photographic reproductions of manufactured products. Much data of value to the engineer are also included. This comprises calculations of pipe sizes and discharge velocities, circumferences and areas of circles, mathematical formulas, boiler and engine-room data, properties of saturated steam and properties of ammonia. The general index is complete.

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Equipment Used Afloat and Ashore

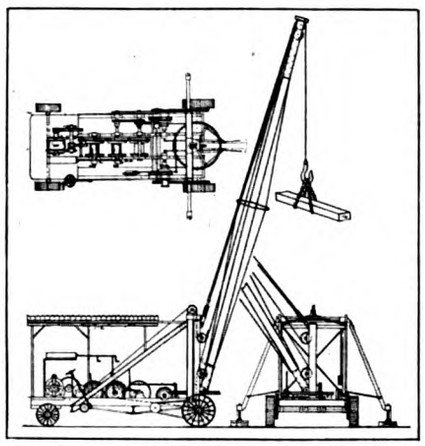
Auto-Crane for use in Shipbuilding Plants

AN EXCEEDINGLY heavy crane is not economical for all purposes in shipbuilding; also the character of the work in modern shipyards requires a wider range of action than is afforded by most stationary cranes. To meet the requirements of mobility and economy of operation, the John F. Byers Machine Co., Ravenna, O., have developed a special auto-crane. The accompanying illustrations show the main features of this machine.

A 30 or 40-foot boom is mounted on a truck on which is assembled the power unit, the control system, and the cable drums. This truck or car, which is 17 feet 10 inches long, is provided with outriggers to render the crane stable under the side swing of the boom. The entire machine weighs from 11 to 14 tons, depending on whether it is mounted on road wheels or railroad trucks. It is designed for lifting 4500 pounds at a 20-foot radius.

A choice of either of three types of power plant is available for the operation of the crane, including a 25-horsepower locomotive crane-type engine, a 25-horsepower motor, or a 30-horsepower vertical gasoline or kerosene engine. Traction is provided through a chain drive to the wheels, which may be standard gage railroad type or special broad road wheels spaced 10 feet in outside width.

This shipbuilding auto-crane, as it is called, may be changed to accommodate



DETAILS OF SHIPBUILDING AUTO-CRANE

a clam-shell or orange-peel bucket for excavation work or for rehandling loose material. Two or three drums are furnished as desired; if only two drums are included in the original installation, a third may be added in the field. For smaller shipyards, building wooden ships, the crane may be worked between the ways.

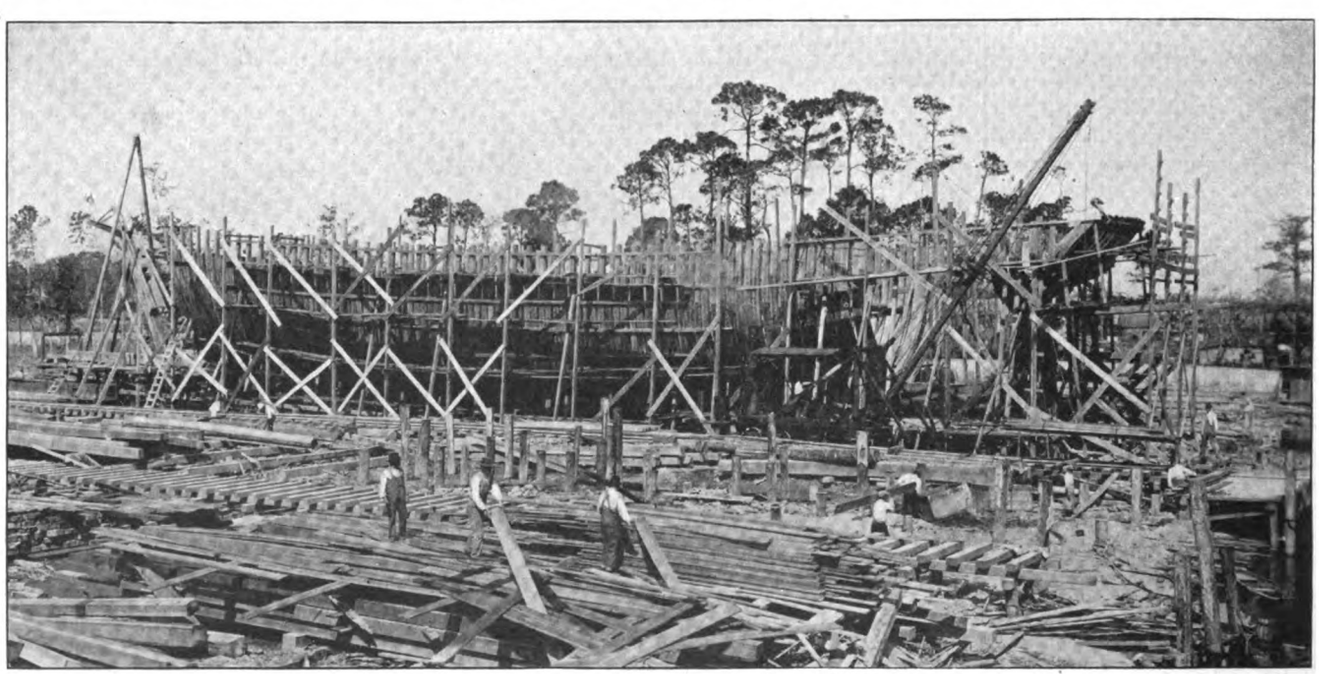
Water Purifying Device

The problem of supplying palatable drinking water on vessels operating on the lakes as well as on the ocean often assumes serious proportions. Notwithstanding the vast amount of rush work going on in shipyards all over the country, consideration is being given to this important detail. Now that navigation on the Great Lakes is at a close, the ships are being refitted for the coming season and devices for assuring an adequate supply of pure water at all times are being installed on a number of boats.

The Jewell Water Improvement Co., Chicago, has developed a device which is said to insure an abundant supply of pure water at all times. Steam is the heating medium and the apparatus is claimed to be automatic in operation. It has only three valves, one each for steam, water and blow-off. The process of distillation leaves the water pure as the impurities contained do not vaporize. To make the water palatable, it is aerated. As the water emerges from the apparatus it is said to be as cold as the incoming water supply.

The main body parts are made of cast iron with all fitting surfaces machined. Such brass and copper parts as come in contact with the water are given a coating of tin.

A number of these stills have been in service for some time on both freight and passenger steamers. Among the vessels using this device are the NIKO, Hamilton Transportation Co., Chicago; EDWARD SMITH, White Gratwick & Mitchell Steamship Co., North Tonawanda, N. Y.; EDWARD BUCKLEY, National Transit Co., Escanaba, Mich.; HENNEPIN, Lake Shore Steamship Co., Milwaukee; and ALASKA, Mullen Coal Co., Amherstburg, Ont.



AUTO-CRANE IN A WOODEN SHIPBUILDING YARD

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